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Principal Contents:

	PAGE
Industrial Switchgear	177
Overhead Line Protection. By Dennis Bryan	180
Non-inductive D.C. Motors. By J. F. Romer	181
Welded Repairs. By C. W. Brett	182
An Automatic Tail-end Booster. By G. L. Porter	183
Compact Worm-reduction Gear	184
Paper Mill Power Plant	185
Electricity in Factories	186
Isle of Man Electrification	187
The Royal Lancashire Show	188
Correspondence: The Rateable-value Charge; Advice to Intending Engineers; Round or Flat Plugs?; Overseas Applications for Appointments	189
The Radio Exhibition	191
Business and Industrial Notes	195
Electricity Supply	198
Traction	200
Communications	200
Contract Information	201
Notes	202
Our Personal Column	203
New Companies Registered	204
Returns of Electrical Companies	204
City Notes	205
Stocks and Shares	205
Published Specifications	207
New Work for Contractors	208

Industrial Switchgear

MODERN developments have introduced difficulties in the control of electrical apparatus in industrial works. The two principal causes are: first, the greater energy liberated under short-circuit, due to increasing capacity of generating plant; and, secondly, the need for ensuring even greater continuity of supply.

The first may now be regarded as presenting no new technical problems, as switchgear can be obtained to function well under far more onerous conditions than those obtaining on most consumers' premises. It is mainly a question of ascertaining the maximum short-circuit kVA at each point and of substituting gear capable of coping with present requirements.

Guidance as to what is, or is not, desirable practice can be obtained from the latest report of the Factory Department, in which attention is drawn to several failures of switchgear with explosive violence. In many cases those responsible for operation are ignorant both of the possible current to be broken and of the manufacturers' ratings, and often the switchgear for the control of works distribution and the larger motors is suitable for only a small proportion of the calculated short-circuit current.

Where the cost of bringing the switchgear up to the requisite standard would be greater than the consumers could afford in the present state of trade, recent developments in high rupturing capacity fuses should not be overlooked. In this replacement work the relatively prosperous supply undertakings might well come to the help of industry, as the changed conditions are due to the growth of the distribution system as a whole. By sectionalising the network and the judicious use of reactors, something can be done; the use of transformers with a rating nearer the m.d. than those installed to meet anticipated extensions, which under changed conditions may be unlikely to materialise in the near future, would be a further help, since it is the inherent reactance of the transformer that usually determines the local short-circuit kVA.

The Report still leaves open the question as to whether the smaller pole-mounted sub-stations come under the Home Office Regulations. Close collaboration of the various interests with the Factory Department's engineers is obviously necessary here, to ensure coincidence of views regarding what constitutes reasonable safety in the event of a legal decision being made later.

Available statistics appear to indicate that there are fewer electrical accidents in Great Britain than in any other country. While this good record is no doubt largely due to high qualities of design and manufacture of our apparatus, skilled operation has done its share. But we shall find some difficulty in keeping the lead if the deplorable idea commented on in the Report, becomes prevalent that there is any economy to be effected by dispensing with the services of senior electrical engineers and leaving the operation and maintenance of industrial plant in the hands of inexperienced men.

A Radio Drive

THE opening of the National Radio Exhibition at Olympia next week will herald a national push to secure half a million more broadcast listeners by the end of the year. Part of this issue of the ELECTRICAL REVIEW is devoted to an account of the exhibits. As successive seasons' models are bettered by the incorporation of additional refinements, the purchasing public continues to be offered increasing value for smaller outlay. Indeed, the only aspect of progress that need cause anxiety for the future is the tendency which has lately become apparent to cheapen the product to the stage at which performance begins to show signs of suffering. Technically the designer seems to be threatened with the approach of something like a dilemma. So much that is new is waiting to be tried that he may soon find himself in the predicament of having almost too much to choose from, the avenues along which he may stroll to-day being diverse and adventurous. Recent developments of a

major kind have included the production of an all-metal valve, while the pentode principle of amplification need now no longer be confined to the low-frequency side. Some of the newer varieties of valve are capable of combining the functions of two valves in one container, which outstanding characteristic will be particularly useful for the application of automatic volume control and push-pull amplification. While the introduction of quiescent p.p. and Class B amplification affords a means of obtaining better and stronger outputs with sparing use of battery current, it must be admitted that the mains-operated receiver is now superior to its battery-fed counterpart in most respects. Extreme selectivity at the expense of reproductive quality is inadmissible, so efforts to improve tuning methods are unabated, and in this respect the introduction of efficient iron-dust cored radio-frequency transformers offer distinct possibilities.

Finality Not Reached

AT the same time, the rapid development of the superheterodyne principle has by no means reached finality. Fashion inclines towards more powerful receivers incorporating five or more valves, and the Empire broadcasting service is stimulating a demand for an adequate short-wave receiver. Empire listeners are at the moment more or less dependent upon foreign sets, whose design and power rarely fits them for the duty expected of them. The provision of a British-made receiver suitable for use outside the British Isles would probably do more to consolidate the Empire service than any transmission refinement the B.B.C. might hope to introduce, in the near future at any rate.

A "Baby" Grid

THE Isle of Man now has its own grid. Its extent is limited by geographical conditions, but it illustrates quite well the lines upon which such schemes should be tackled. The design of the 33-kV interconnected system makes for initial economy in construction combined with reliability, and the decision to purchase a supply in bulk from the existing Pulrose generating station of Douglas Corporation will result in a considerable saving in development charges, which at one time so handicapped any enterprise for the supply of electricity in thinly populated areas. The energies of the Electricity Board can be devoted to loading the mains. In view of the large proportion of standing charges to the total costs, we hope that consumers can be persuaded to adopt high-load factor apparatus, of which water heating and pumping are the more obvious.

The American Movement

SOME further interesting details are given on another page of the discussions in which the various sections of the American electrical industry have been engaged in their efforts to adapt themselves to the requirements of the President's Trade Recovery Act. General Johnson, in addressing the editorial group of the Associated Business Papers, Inc., said that they must always keep in view the main purpose of the Act—to put the people back to work. "If you don't do that you are going to have a crash!" The *Electrical World*, under the heading "Washington Shocks Cause No Shivers," remarks that: "High-voltage emissions from Washington continue to disintegrate the depression. The latest is a come-one-come-all campaign to shorten hours and raise wages irrespective of N.I.R.A. codes and business conditions—a sort of love labour holiday until fall, to increase employment and purchasing power."

Electrical Orders Flowing In

THE idea is described as "good," but our contemporary asks how business enterprises now "in the red" and with sales only sufficient for a twenty-hour week can "sing in harmony." The critical vein, however, is forsaken for a characteristic recital of facts showing that business is better, that vacant shelves are being filled, that inquiries and orders for electrical goods are flowing in from all parts of the country; that "refrigerators continue to sell like hot dogs"; that there are no immediate clouds on the horizon, and "electrical men are optimistic again," and so on. It is noteworthy that last week's report of U.S. electric power output showed an advance of 15.4 per cent. as compared with last year. Some reports on the general industrial attitude toward the President's plan state that 200,000 out of 2,000,000 employers have fallen into line. Ford, however, who counts for much, has not consented, because he is already paying better wages than the Code requires. Are the non-contents the more likely to come in because General Johnson has threatened non-co-operators with a "sock on the nose"?

Foreign Opinion

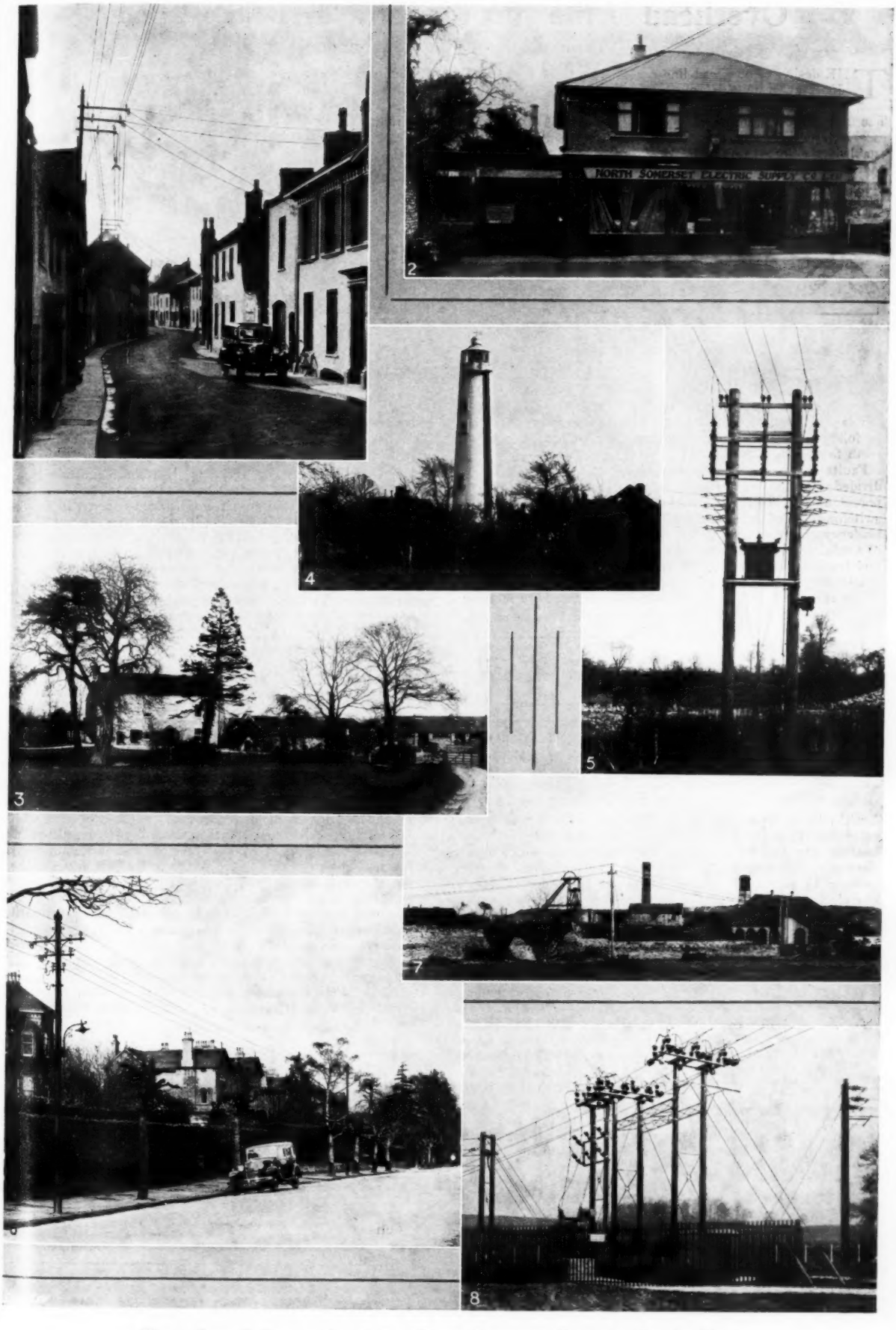
IF we enjoy no great lead over other countries in turning out mass-produced articles we have little doubt about our ability to hold our own in any field in which designing ability and skilled workmanship are the main factors in success. This is fully recognised abroad; such admirable engineering works at home as the construction of the grid have but heightened the prestige gained by our electrical manufacturers through the performance of the varied types of plant and cables that have been exported. We congratulate to-day the English Electric Co. and the Metropolitan-Vickers Electrical Export Company on securing the contract for the 3,000-V d.c. electrification of the Warsaw Railway Junction, details of which are given on a later page. The Polish Government has evidently every reason to be satisfied with British electrical products, largely as a result of previous dealings with the E.E. Co. We believe every such scheme abroad undertaken by British electrical firms will, in cumulative manner, enhance our prestige and bring new orders of all kinds to this country.

The Salford Show

IT was pleasing to note that the Manchester newspaper Press gave prominent attention last week-end to the demonstration of electrical farming and domestic machinery and equipment at the Royal Lancashire Show at Salford. Portable motors for driving churns or pumps, refrigerators, electrically heated incubators, live exhibits from an all-electric poultry farm, and so forth, were brought together by the Lancashire Electric Power Company, and they excited much interest. The published articles show the impression made upon the mind of the journalist, and form good examples of appeal to the public concerning all kinds of uses of electricity. Sir Wm. Beach-Thomas, in a full article describing the Show, singled out the electrical poultry-keeping and plant-growing exhibit as a class of enterprise in which Lancashire is giving England a lead at the present time.

The Two-part Tariff

OUR correspondence columns during the past few weeks show that it is still imperfectly realised that the low "unit" charge of the two-part tariff, which is necessary to encourage greater consumption, is possible only because the standing charge is made to cover costs that do not vary with usage. This standing charge bears an approximate relation to the size of house, and obviously must be met somehow. Its omission as a separate entity would entail a high average charge for electricity, which would be an effective obstacle to its use for larger appliances, or the substitution of a graduated block rate, the merits of which were reported in 1930 by the representative committee appointed by the Electricity Commissioners to be less than those of the two-part tariff. The baker can fix a constant price for his product because the demand of the community for bread can be easily gauged. Similarly, if all people had all-electric houses it would be practicable to make one charge for each kWh used in the home.



Examples of the work of the North Somerset Electric Supply Co.

1. Cranked poles on the footpath of a narrow street. 2. One of the company's branches. 3. An all-electric model farm. 4. A Trinity House lighthouse with automatic electric lighting. 5. A typical rural sub-station. 6. A steel-pole line erected sixteen years ago. 7. A colliery, showing 11-kV lines to sub-station. 8. The Chewton Mendip 500-kVA, 33/11-kV step-down transformer sub-station

Overhead Line Protection. By Dennis Bryan

Application of the Petersen coil

THE design of overhead line systems of transmission and distribution in this country has developed upon very different lines from those adopted on the Continent. The difference between the underlying principles used in each case is largely due to the work of Dr. Petersen which has enabled the protection of overhead line systems to be approached from what is to us a novel point of view. The majority of faults on overhead systems are faults to earth; in fact, there is evidence that nearly 90 per cent. of the

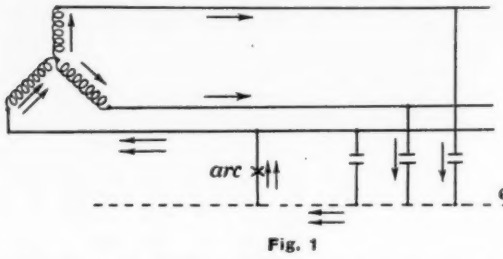


Fig. 1

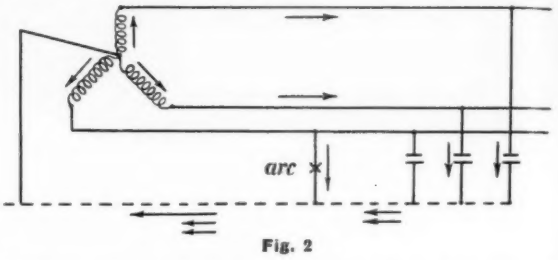


Fig. 2

"outages" on overhead systems are due to ground faults. It follows that the provisions made for protection against earth faults are of paramount importance.

Faults which occur on overhead systems can be roughly divided into those caused by surges due to external atmospheric and lightning effects, and faults caused by internal switching surges, broken and dirty insulators, &c. The general tendency of surges is to produce earth faults, either by means of a solid metallic connection due to the breakdown of machine and transformer windings, or more generally by means of an arc spilling over the insulators.

The effect of a spill over on the line insulators is to increase the voltage to earth to $\sqrt{3}$ times its normal value on the

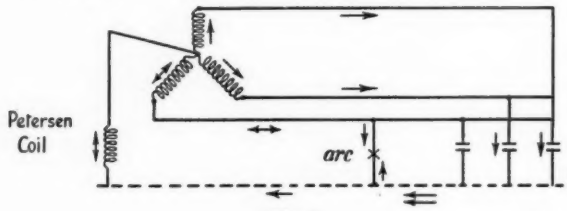


Fig. 3

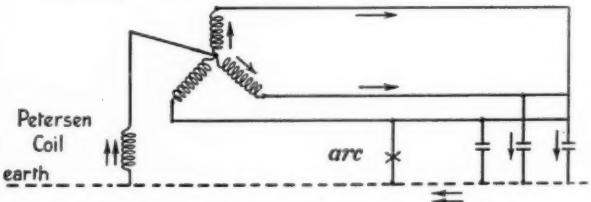


Fig. 4

healthy lines. The fault current flows from the line to earth, returning through the distributed capacity paths of the healthy lines, as shown in fig. 1. The current which flows depends upon the length of the lines, their capacity, and the voltage to earth. For small values of the order of 3-6 A the electromagnetic effects of the spill-over arc are sufficiently strong to make the arc self-extinguishing due to blow-out effects. On many systems, however, the capacity current under fault conditions is considerably greater than these limiting values, and the spill-over arc will continue to restrike due to its increased ionising effect.

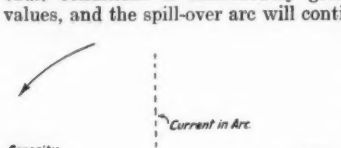


Fig. 5

The arcing ground so formed produces a train of voltage surges which increase in magnitude by their cumulative effect, making each successive arc larger and more vicious and leading to a complete short-circuit of the lines. It is not advisable to operate overhead line systems with large capacity currents entirely insulated for this reason. The highly dangerous effects referred to can be overcome by earthing the neutral point of the system. The fault current then takes the path shown in fig. 2, and any fear of an arcing ground is eliminated, since faults to earth short circuit one leg of the circuit and automatically trip the main oil circuit breaker. This method also provides an anchoring point for the system capable of draining off over voltages and enables a definite value of fault current to be obtained for relaying purposes.

The practice of earthing the neutral point of overhead systems has become almost standard in this country and in North America, but objections are that it subjects the system to a single-phase short-circuit every time an earth fault occurs and also that it prevents the system being operated, even temporarily, with one line earthed. The short-circuit current to ground is often limited by earthing the system through a resistance designed to relieve the system of heavy short-circuit stresses without removing the anchoring point of the system altogether. The second objection, however, still remains.

The earthing of the neutral point of a system limits the damage caused by an earth fault, but does not otherwise improve the continuity of supply or reliability of the system. Dr. Petersen's coil not only limits the damage caused by earth faults or arcing grounds, but also increases the system reliability by enabling it to be operated with one line earthed. This device is widely used on the Continent and to some extent in America.

The Petersen induction coil has impedance equivalent to the distributed capacity of the lines, and is connected between the neutral point of the system and earth as shown in fig. 3. When an earth fault occurs on the system the current flows to earth, returning through the parallel paths offered by the Petersen coil, and the current in the distributed capacity paths of the healthy lines is exactly equal and opposite in phase to that flowing through the coil. These currents are indicated separately in fig. 3 for simplicity, but are actually superimposed, and, in effect, neutralise one another so that the current through the arc is at or near zero, as shown in fig. 4.

The disposition of the currents in the coil and capacity paths is depicted vectorially in fig. 5. The small in-phase component of current shown in this figure is due to the I^2R losses in the lines, the earth circuit, and the Petersen coil itself. In practice this earth current is reduced by the coil to a very small value, and can be as low as 5-10 per cent. of the value it would have in the absence of the Petersen coil.

The efficiency of the Petersen coil as a protective device is not greatly affected by changes which may be brought about in the system capacity by sectionalising up to about 25 per cent., but if the capacity current of the system is varied beyond this value it is advisable to make similar changes to the impedance of the coil. This adjustment is generally effected by means of taps on the coil windings. From a series of tests it has been found that the Petersen coil does not lose its capacity to suppress arcing grounds or to protect the system generally even when the coil is traversed by out of

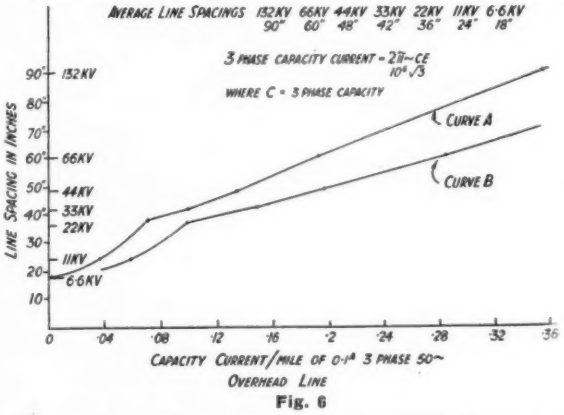


Fig. 6

Some Municipal Electrical Engineers

From left to right: Mr. J. E. Tapper, Beckenham; Mr. A. J. Ryan, Hastings; Mr. R. C. Harpur, Dover; Mr. J. Leadbeater (*Elliott & Fry*), Hampstead

Non-inductive D.C. Motors. By J. F. Romer

Separate field excitation and compensating pole windings

THERE are several pieces of apparatus in which use is made of a small reversing series motor which is started by means of balanced platinum or mercury contacts. Typical examples are the azimuth motor of the gyro compass, which is started by means of a roller working on flat contacts, and the motor used on a certain kind of automatic voltage regulator, which is started by a metal point dipping into a mercury cup. In both these cases the break is a slow one and the maximum distance between contacts small.

In practice, so long as the power of the motor is very small, say, 0.001 h.p., it can be started direct from the contacts, but when the h.p. approaches 0.01 there is considerable trouble from sparking at the contacts with the well-known results: platinum or silver contacts stick, and mercury becomes oxidised, rendering contact uncertain; even when the mercury is covered by a layer of oil, this soon forms a sludge and gives trouble. Mercury-in-glass-tube switches have been tried, but the movement of the mercury upsets the balance and causes hunting.

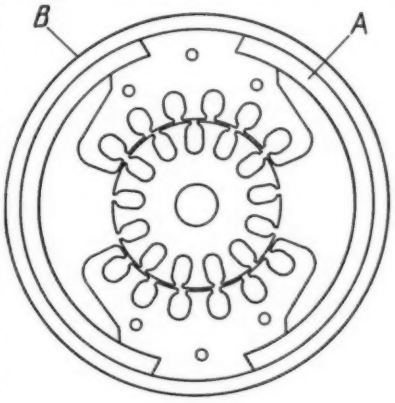


Fig. 1

It has therefore been found necessary to interpose a relay between the balanced contacts and the motor; but, apart from increasing the cost of the apparatus, relays used under these conditions are very liable to vibrate, resulting in the motor hunting and the starting contacts burning away very rapidly. It would, therefore, be a considerable advantage if the sparking at the balanced contacts could be sufficiently reduced to enable them to start the motor direct.

There are two reasons for the destructive sparking: (i) the voltage on which the motor is run is sufficient to maintain an arc across the contacts; and (ii) the rise of pressure caused by the self-induction of the motor. To overcome (i) the motor can be operated at a voltage below the minimum required to maintain an arc across contacts of the particular metal used. The minimum is 15 V for solid metal and mercury, and 12 V for silver. To combat (ii) the motor itself can be made non-inductive by using a separately excited field system and placing a compensating winding in slots in the pole pieces. The separate excitation can be most readily obtained by making use of permanent magnets.

A series motor of 0.005 h.p. at 2,000 r.p.m., designed by the writer, took a full-load current of 1 A at 10 V and had an inductance of 0.15 henry; if the circuit was broken in 0.02 sec. the rise in pressure was 7.5 V, a small rise, but sufficient to produce undue sparking. This was overcome by eliminating the series field and using a compensating winding. Fig. 1 illustrates the field system of this motor. The permanent magnets A are pressed into an external casing B, the laminated poles being dovetailed in. It will be noted that the number of slots in the poles is one less than in the armature; this is only a constructional feature—the number of ampère-turns is the same in both.

A great advantage of this system of neutralising inductance is that silver contacts can be used with very satisfactory results and a great reduction in cost. Another advantage is that the condenser commonly used to absorb sparking is not required. It is worth noting that if this motor had been run at 100 V without compensation the rise of pressure on breaking circuit would have amounted to over 70 V.

The compensating winding has been largely used on a.c. single-phase series motors for improving power factor, but, so far as I am aware, has not previously been used on d.c. motors for the purpose described. The winding is quite normal and is connected as usual in series with the armature and in magnetic opposition.

Overhead Line Protection (*concluded from opposite page*)

balance currents of the order of 50-100 A. This peculiar property of the coil can be understood from a fundamental consideration of the discharge of a condenser through an inductance.

As the Petersen coil is designed to have an impedance exactly equal to the capacity of the lines, it is essential when inquiring for, or designing, such devices to state the capacity current of the system to which it is intended to connect it. Fig. 6 gives the capacity per mile for the arrangements of overhead lines generally adopted in this country. Curve A gives the capacity current of an 0.1 sq. in. three-phase overhead line at 50 for the spacings generally adopted for the voltage range from 6-132 kV and curve B gives the value of the capacity current to ground when one conductor is earthed. This is the current which has to be counter-balanced by the Petersen coil, and is approximately one and a half times the normal three-phase capacity or charging current of the system as shown in the figure. The kVA capacity of the Petersen coil is then given by the product of the current given on the curve B and the line to neutral voltage.

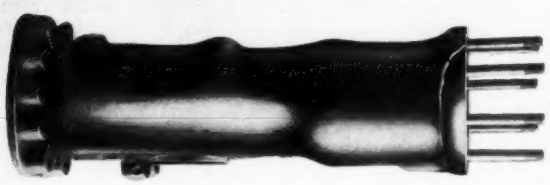
It is not customary to consider the operation of overhead systems for even short periods with one line earthed, but when considering the use of this protective device it is strongly advocated that this procedure should be adopted. It is possible by so doing to improve the continuity of supply and system reliability without sacrificing any other factors, but, of course, the coil has to be designed for continuous use. The adoption of this point of view opens up many possibilities which otherwise would not be possible, and is particularly valuable in England where there are a great number of lines of comparatively short length operating at voltages of from 11-66 kV which could be admirably protected by this means.

Welded Repairs. By C. W. Brett, M.I.W.E.

IN the manufacture of electrical plant and apparatus welding is finding a rapidly increasing usage. The opportunities which it extends in connection with repairing and reconditioning work are by no means so widely recognised. For example, it is not generally understood that the difficulties at one time associated with pre-heating and controlled cooling have now been overcome. Further, engineers in the electrical industry are for the most part unacquainted with the versatility of present-day welding processes, not only in connection with the repair of cracks and fractures but for building up worn parts and replacing defective sections.

Welding repair practice has advanced very rapidly during the industrial depression of the past few years, because in so many industries every means for effecting economies in the upkeep of plant have had to be explored. The specialist welding repairer has been called in to keep old machines at work when in more prosperous times they would have been replaced. The consequences have been, first, a wider realisation of the possibilities which welding holds and, secondly, such important advances in welding technique that it can now be claimed that there is practically no metal part used in industry to-day which modern welding processes cannot maintain indefinitely in service.

An illustration of the value to the electrical industry of these repairing processes was afforded recently when it was found that the vertical riveted seam of a large condenser casing, which had just been installed in a new large power station, could not be kept free from leakage. The casing, which was in two halves, was of sheet steel partly fabricated by welding and the upper portion formed the bedplate for the turbo-generator. After many efforts to eliminate leakage had been made by the manufacturer of the casing a specialist welding repairer was consulted. Examination showed that it was possible to weld the entire length of the unsatisfactory riveted seam, and the work was rapidly and efficiently completed on the site. In this case a complicating factor was that a considerable amount of "overhead" work was involved to make the seam sound where it passed under the foundation plate.

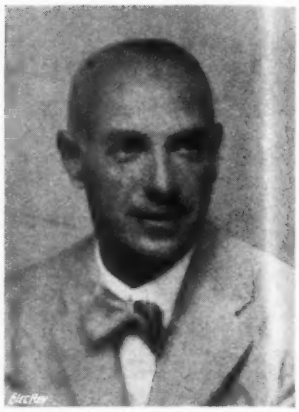


A Diesel cylinder (length 7 ft. 6 in., bore 16 in., weight 4 tons) with a badly cracked water jacket which was successfully repaired by welding

Most condenser bodies are of cast-iron in two or more sections joined by flanges which often crack or break away at the bolt holes. These mishaps can be easily repaired by welding, either on the site or in the welding engineer's factory, and any necessary local reinforcing can be done at the same time to ensure that there will be no recurrence of the trouble. Often large castings of this kind are provided with eye bolts so that they can easily be lifted by a crane; it is by no means unusual for cracks to be set up around these eye bolts which may even be torn right out of the casing. An example of this occurred recently: a large turbo-generator set was ready to undergo its first tests when leakage was discovered around one of the eye bolts of a turbine pump casing; apparently an attempt had been made to lift the casing by the eye bolt before it had been properly freed. This casing was made in two halves and the rotors had a very small clearance. In spite of this an entirely satisfactory welded repair was made, and when the pump casing was refitted the joint faces were true, the bearings were in correct alignment, and the rotor clearances were found to have been undisturbed.

Turbine casing flanges can be repaired with the same certainty of success as that which attended this less difficult fracture, and pumps of all kinds are coming increasingly into the welder's hands. It is not generally realised that pump shafts scored at the point where they pass through the gland can be built up by welding and remachined to size; worn impeller blades can also be restored in the same way.

Steam boilers are often the most expensive part of an electrical plant to keep in sound condition and here, again, welding allows important economies to be effected both in direct expenditure of money and in the period of the shut-down. The most usual troubles are with the parts of a boiler which are in contact with the fire and are due to a riveted joint necessitating a lap. Mill scale is almost always present on the surface of steel boiler plate and it is a non-conductor of heat. When a riveted joint is in direct contact with the fire the outer lap of the joint becomes excessively hot and expands rapidly because the temperature is not kept down by the water in the boiler, whereas the inner lap, being in intimate contact with the water, does not expand at the same rate. In time this causes the rivet holes to split, the rivets to come loose and the joint to develop a serious leak.



Mr. C. W. Brett is managing director of Barimar, Ltd., scientific welding engineers

In a case of this kind the welding engineer does not merely weld up the defective seam; he cuts it right out and welds in a patch. This patch, however, would be more accurately described as an insert, because a butt joint is made between the edges of the patch and the original plate. A great advantage of this method of repair is that no crevices or pockets are left in which mud can collect. The work calls for very great skill, first, because the welding operations are carried out under very trying conditions and, secondly, because of the importance of leaving no unrelieved stresses in the material of the boiler. When work on boilers is being undertaken any corroded parts of the furnaces can be cut away and replaced; this is a very valuable and time-saving branch of welding repair work.

Troubles often arise from cracks which are set up around the fuel valve housings of Diesel engines, in the centre of the heads (or covers) due to the enormous temperatures; the only permanent remedy is to cut away the cracked and burnt metal and to weld in new iron. When Diesel heads are repaired in this way they stand up just as well as new ones. Smaller oil engines and gas engines driving generating sets, which are not always housed in buildings maintained at an even temperature, are susceptible to damage by frost and can be rapidly repaired by welding. Even when bores of the cylinders are cracked or broken away they can be successfully repaired without enlarging the bore.

An annoying trouble which sometimes occurs with certain types of internal-combustion engine is water leakage past the "landings" or joints between the liners and the water jackets. The liners are a tight fit in these landings and a rubber packing keeps the joints watertight when the liner expands and contracts. When leakage occurs the landing or joint surface of the water jacket can be built up and remachined so that a sound joint can be made when the liner is refitted.

A Diesel head with cracks running from the fuel valve housing to the exhaust valve housings which were welded in five days

Among the smaller operations which welding engineers can perform inexpensively are repairs to transformer and motor casings, junction boxes, pavement covers, and so forth. Aluminium parts of all kinds are also easily repairable by welding. Many containers and tanks are now fabricated by welding and, as in the case of boilers, defective and corroded places are cut out and new metal is welded in. Pressing and stamping machines may be broken owing to tools being left on the bed or to two thicknesses of metal being inserted instead of one. When fractures of this kind are repaired by welding there is no difficulty in reinforcing the entire casting so that it will be better able to withstand an overload. An expert specialist welding concern is always ready to guarantee the success of a repair and can invariably quote a price that is substantially less than the cost of a replacement part.

An Automatic Tail-end Booster. By G. L. Porter, M.I.E.E.

THE chief considerations affecting the sale of any commodity are quality and price, and in the case of a.c. supply to domestic consumers improvement in quality is represented by reduced variation in frequency or in voltage. Constancy of frequency involves very little additional cost to the supply authority and, therefore, price to the consumer. Variation of voltage has, however, a direct economic effect.

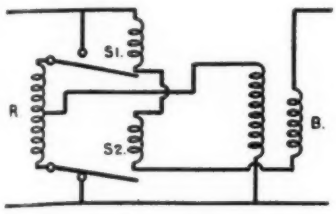


Diagram of a single-phase unit

If a lamp, valve, or heating element is arranged to be at normal temperature under minimum voltage conditions, over-running at other times will shorten the life of the element and maintenance cost will be increased. If over-running is avoided and the consequent low temperature at minimum voltage is off-set by the use of a larger element, both the original and the renewal costs of elements will be increased. Further, in the case of lighting, seeing that it is the minimum value which is critical, there will, at times, be excess lighting, resulting in an increase in the amount of electricity consumed. On the other hand, much the largest item in the cost of giving domestic electricity supply consists of capital charges on the mains, and the larger the voltage drop allowed the lower will be the cost of the mains and the lower the average price per kWh charged to the consumer. Thus the total cost to the consumer consists of one part which increases and another which decreases with the range of voltage variation. For any given distribution area there will therefore be a range of voltage variation, the choice of which will result in the total cost to the consumers being the minimum.

Tail-end Voltage Drop

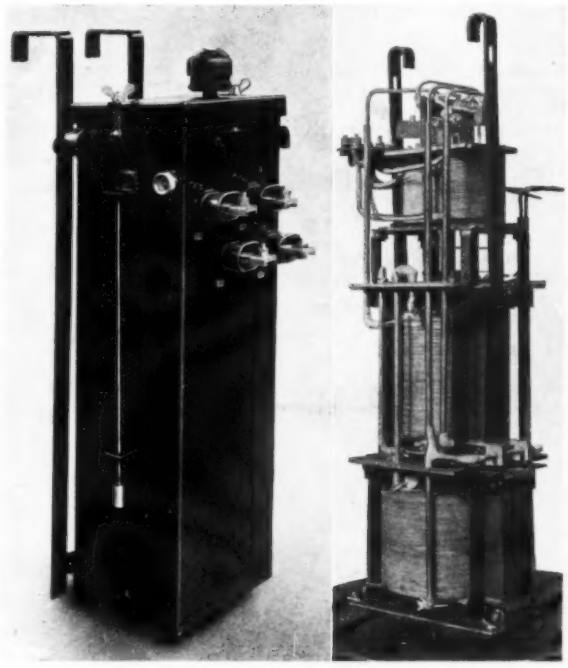
It is questionable whether the laying of extra copper in the ground is the most economical method of voltage regulation. Apart from the original expenditure, the method is extremely inflexible, for cable once installed cannot be modified except at very great cost. When a low-voltage distribution scheme is laid out spare thermal capacity must be provided to allow for some anticipated growth of load, and such spare capacity will keep the voltage drop within limits until the load has risen to a certain value. It is seldom, however, that the load grows exactly as anticipated; usually the whole drop allowable is absorbed in one tail end long before the rest of the network has reached a like degree of loading. When this state of affairs is reached, no further load may be connected to that tail end until some means is adopted for reducing or counteracting the voltage drop. Increasing the copper section is usually impracticable, and the alternatives are the provision, either of some form of booster, or of a high-voltage extension and additional transformer.

It was to meet this condition that the Ferranti tail-end booster was evolved. It is intended for installation at that point on a distributor beyond which all consumers' supplies would, in the absence of a booster, have varied beyond the limits allowed. Such a booster: (1) is not really concerned with the voltage as such, but merely with the drop in voltage due to the local load; (2) it must be as simple as possible and require the minimum of inspection and maintenance; (3) the load on the tail end with which the booster has to deal is small; (4) the percentage of boost necessary is also small, being the difference between the drop in that tail end and the maximum drop allowable.

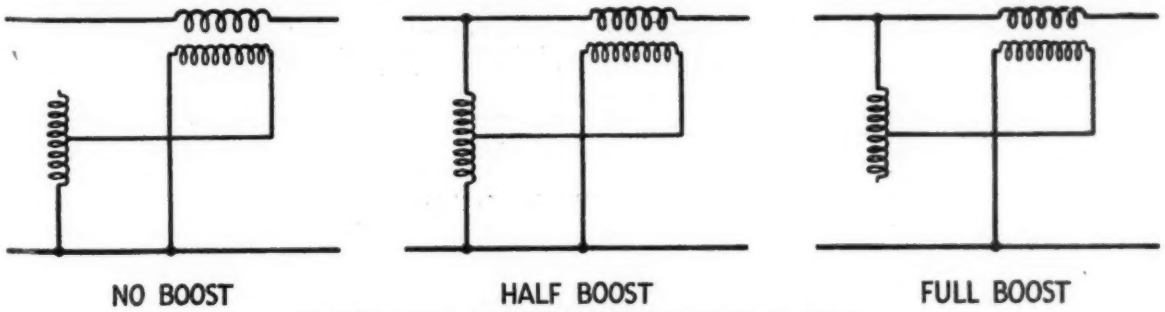
Advantage is taken of (1) to dispense with the usual sensitive voltage relay as well as the driving motor and other apparatus customary in ordinary voltage regulators, the tap changing being operated by simple solenoids either connected directly in the main circuit or fed through current transformers. The adoption of control by current only in place of voltage has several advantages. The apparatus is extremely simple and robust; the necessary accuracy of setting is much less than with voltage control, due to the fact that the quantity upon which the control depends is varying from zero up to 100 per cent. instead of varying only about 10 per cent.; hunting is also impossible. One of the main advantages of current control is that the frequency of operation is reduced so considerably that a larger size of step may be used. This in turn reduces the number of steps necessary; only two steps are used, a number which permits of interlocking—the bugbear of electrically operated contactors—being almost completely eliminated.

Constructional Features

The tail-end booster is extremely compact, completely oil immersed in a single tank, and requires no attention or adjustment after installation. A single-phase unit consists of a small boosting transformer, the secondary of which is in series with the line; a small reactor with a tapping near the centre of the winding; and two mercury-tube switches, each operated by a solenoid and plunger. Switches of this type have proved extremely reliable, require no maintenance of contacts, and the absence of oil carbonisation makes the provision of a separate switch chamber unnecessary.


The booster in and out of its casing

The diagrams show that the primary of the boosting transformer B is either short-circuited to give no boost, connected between phase and neutral to give full boost, or connected across half the winding of the reactor R, which, acting as a 2:1 auto transformer, gives the half-boost position. The placing of the switches on the primary side of the boosting transformer has two important advantages. First, owing to the extremely small value of the full-load current in that position, a switch can be used which, although of reasonable



Methods of connecting the primary of the boosting transformer

size, is capable of dealing with the short-circuit current of the distributor. Secondly, owing to the primary of the booster being short-circuited in the no-boost position and the first step of boost only coming into operation at about half-load, the no-load loss usual in transformers and regulators is absent during the great majority of the hours of service.

In polyphase or three-wire single-phase tail ends, the booster may consist of single-phase units boosting the outers separately, or a cheaper polyphase or three-wire single-phase unit may be used in conjunction with a static balancer. It must be realised, however, that although a three-wire single-phase balancer equalises the currents in the outers as well as the voltages to neutral, a three-phase four-wire balancer does not equalise the phase currents sufficiently to allow of a polyphase unit being used in cases where the out-of-balance load is unusually large. Where a balancer is used it is preferably kept distinct from the booster, partly because the balancer is likely to be required some time before the booster becomes necessary and partly because of the essential difference between the considerations governing the correct choice of positions for the two units. In general, the balancer should be a good deal farther out from the sub-station than the booster.

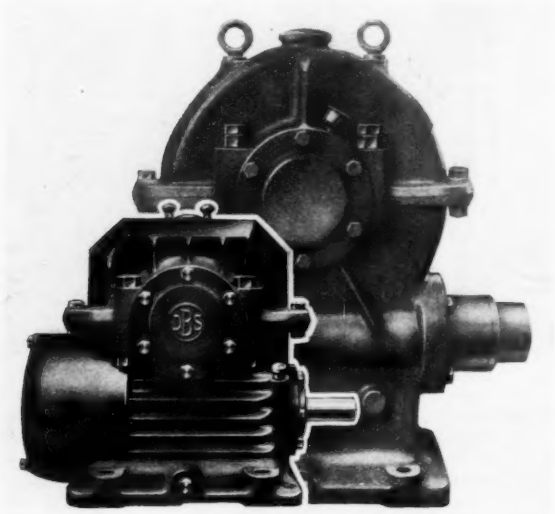
A number of tail-end boosters may be inserted at suitable intervals in a long distributor, each taking care of the voltage drop between the previous booster and itself, but there are limits to the number which may be so used. A booster which changes the voltage in steps cannot boost the circuit by an amount equal to the whole voltage drop, the amount allowable depending upon the number of steps used. The allowable boost is also decreased by the fact that a greater current is necessary to draw a plunger into its solenoid than to retain it there against the resetting force. In the tail-end booster the latter effect is small, the solenoids having been specially designed to give a "release" current 85 per cent. of the "pick-up," but the reduction in boost due to the use of steps makes each booster added to a series less effective than the preceding units.

The tail-end booster has a sphere of utility quite distinct from that of the ordinary forms of voltage regulator. It is not concerned with what happens in the high-voltage system, its purpose being to allow low-voltage distributors to be run with a voltage drop greatly exceeding the amount otherwise allowable. The development of this booster has put into the hands of distribution authorities a very useful weapon which, owing to its low cost, will in many cases allow additional load to be profitably connected where the much more costly alternative high-voltage extension with its necessary transformer, &c., would be unremunerative for perhaps many years. The illustrations show a unit arranged to give 6 per cent. boost in a 25-kVA, 460-230-V, 3-wire, single-phase circuit.

Compact Worm-reduction Gear

Small size and efficient lubrication are features of the "Radicon"

MESSRS. DAVID BROWN & SONS (HUDDFD.), LTD., have just completed the "Radicon" speed reducer, in which particular attention has been paid to the design of the gear housing. This reducer is designed to increase the transfer of heat from the housing, so that more of the potential load-carrying capacity of the gears themselves can be utilised.



Comparison of "Radicon" and ordinary worm-reduction gear for the same duty

Radiation is increased by an increase in total surface area; convection from the upper part of the housing is augmented by vertical ribbed surfaces; and heat from the lower portion is conducted away by a stream of cold high velocity air projected along horizontal channels. The result is a reducer which is claimed to be capable of transmitting up to 100 per cent. more power than one of orthodox design for the same temperature rise; for a given duty, therefore, a much smaller gear can be employed than hitherto. The increased loading on the bearings has been met by the use of oversize bearings which are automatically lubricated by oil, effectively retained at all speeds.

The first series of "Radicon" reducers to be produced is of the single upright type fitted with "David Brown" worm gear. On the worm shaft tests showed that two radial ball journal bearings, carrying all journal and thrust loads, give both the lowest bearing temperature and the simplest construction. The wheel shaft is similarly carried on radial ball bearings, an additional roller bearing being provided when external overhung loads have to be carried. These bearings, above the level of the oil bath, are positively and continuously lubricated.

The housing has a dual function to perform; to locate the bearings as rigidly as possible, and to transfer the heat from the oil to the air. In the upper half, vertical ribs give the necessary stiffness and form vertical convection channels; in the lower half, the ribs are horizontal. At one end, a cowl closely fits these ribs and encloses a fan mounted on the worm shaft. Air flows at high velocity through the channels between the ribs and the cowl along the whole length of the housing.

The worm shaft, which is of 3½ per cent. nickel casehardened steel, carries two oil flings which transfer a liberal supply of oil to the worm wheel; the oil bath also lubricates the worm shaft bearings.

Above the wheel shaft bearing level, oil collectors gather oil from the wheel rim and lead it to a trough communicating by drilled holes to the outer end of each bearing, whence it passes through the bearing and back to the sump. These oil collectors are effective even at the lowest speeds, and work in both directions of rotation, providing automatic and continuous lubrication.

The oil-level indicator is in the form of a dipstick, the pocket for which can also accommodate a thermometer when desired.

Leakage of oil is prevented by double-wall oil baffles and oil flingers, any oil which passes the first baffle being flung off before it reaches the second and draining back to the sump.

Immediate delivery of units ranging from 4 in. up to 14 in centres can be given, and the range will be extended in due course.

A "Converted" Goods Truck

THE addition of a storage battery and electric motor to an ordinary railway wagon of the flat-platform type to fit it for shunting service on private sidings is reported by *Elektrotechnische Zeitschrift*. A 10-kW motor with spur gearing, coupling, and chain sprocket, drives the truck through a chain and wheel. The equipment includes a controller, regulating resistance, and brake, and the whole driving unit is mounted on a plate attached to the underside of the truck frame, with a step for the driver. The batteries are carried by wheels running on rails attached to hangers. The cost of the equipment, with a battery capable of dealing with a 100-ton train and running 15-18 miles a day, is given as follows (at 20 marks = £1): driving unit, £225; battery, £130; carriage and fitting, £15; total, £370:—

	Per annum. £ s. d.
6 per cent. interest plus 2·7 per cent. depreciation ...	27 10 0
Mechanical maintenance 3 per cent.	6 15 0
Battery maintenance and renewals	60 0 0
Lubrication	1 10 0
Energy 10,000 kWh at 0.6d.	25 0 0
Miscellaneous	4 5 0
Total	£125 0 0

This averages 8s. 4d. per day (300 days per annum), to which must be added the wage cost of the driver, who will generally be occupied only a few hours per day in this service. It is claimed that the electrified truck is the cheapest and simplest equipment available for moving heavy trains in and about industrial establishments.

Paper Mill Power Plant

THE power plant erected by Messrs. Wiggins, Teape and Co. (1919), Ltd., at their Dartford paper mills, Kent, adjacent to the new greaseproof mills, generates power and steam for both mills. International Combustion, Ltd., advisory engineers, assisted the firm's own engineering staff in the design and erection of the plant.

Three tri-drum boilers (Combustion Steam Generator, Ltd.), each capable of a maximum continuous evaporation of 65,000 lb. per hour, give a steam pressure of 475 lb. per sq. in., and temperature of 750 degrees at the stop valve. The boilers are fired by Underfeed "L" type stokers with "Usco" coal handling plant. The make-up water supply for the boilers is passed through a "Neckar" water-softening plant.

Steam turbines of the pass-out type were chosen to supply both the power and the process steam requirements, and the whole of the turbo-alternators with their auxiliary motors, the h.p. and l.p. switchgear and cables were supplied by the General Electric Co., Ltd. The turbines were made at the Fraser & Chalmers Engineering Works, Erith, the electrical plant at Witton, and the cables at the Pirelli-General Cable Works, Ltd.

The Turbine Plant

The three turbines of the impulse type, each driving an alternator through gearing, are of 3,750 kW maximum continuous rating at 3,300 V, 3 phase, 50 cycles, 0.8 p.f., and can pass out up to 45,000 lb. of steam per hour at a pressure of 28 lb. per sq. in., when supplied at the stop vaive with steam at 455 lb. per sq. in. superheated to 740 deg. F.

The designed economic load of each set is 3,000 kW with 40,000 lb. per hour pass-out steam at 28 lb. per sq. in., and each machine is capable of generating a minimum of 1,800 kW when no steam is being extracted.

The operating speed of the turbine is 6,000 r.p.m. and there are eight single stages from the inlet to the pass-out connection, and six single stages between the latter and the condenser. There are three automatically operated and one hand operated control valves on each turbine. The pass-out pressure can be varied from 22 to 34 lb. per sq. in. by the action of an "Arca" regulator and variations in the steam pressure cause the regulator to vary the oil pressure which operates sleeve valves through which the steam passes to the l.p. end of the turbine. The movement of the sleeve valve is also transmitted through a link gear to the turbine governor, thus ensuring constant speed with varying steam pass-out quantity and electrical load.

The turbine shaft is connected through a flexible coupling of the claw type to the pinion of a single reducing double helical gear made by Messrs. David Brown & Sons for a six to one speed reduction, the driven shaft solid coupled to the alternator rotor running at 1,000 r.p.m. Duplicate extraction pumps of the vertical spindle type are driven by six 6-h.p. Witton motors fed from a d.c. supply and the condensers are of the horizontal-surface type manufactured by Hick Hargreaves. A 3,300-V feeder from the power station is taken to a steel plate cubicle in the pump house and stepped down to 400 V by a 125-kVA oil-immersed transformer for the vertical spindle circulating pumps, of a capacity of 187,200 gallons per hour each. Each 47-h.p. pump motor is fitted with a star-delta contactor starter and arranged for starting or stopping either locally or by push-button control from the turbine room. Two 1½-h.p. strainer motors cut in and out automatically when the appropriate circulating water pump is started up or shut down. A vertical spindle sump pump of 15,000 gallons per hour capacity, driven by a 3½-h.p. motor, provides for drainage requirements.

The alternators have a normal output of 4,700 kVA each when running at 1,000 r.p.m., 3,300 V, 3 phase, 50 cycles. Cooling is assured by a closed-circuit system of ventilation in which an air cooler is supplied with water from the circulating system. The exciters are overhung direct on the rotor shaft, the voltage being 150 V.

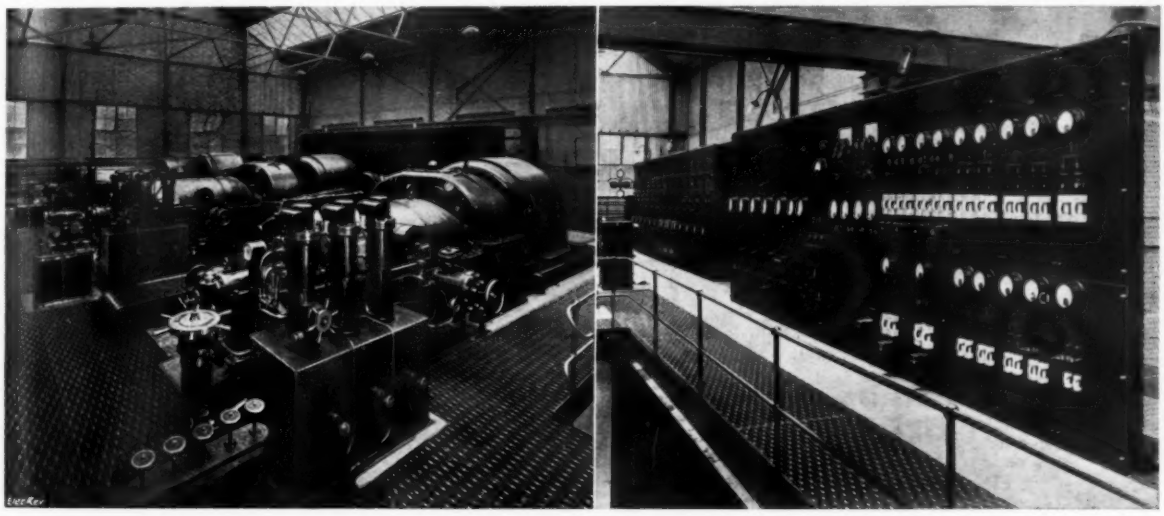
Switchgear

The main high-voltage switchboard, which is of the fully interlocked sheet steel cubicle type, totals thirteen panels, three of which control the supply from the turbo-alternators, three supply the pump house, power-house transformer, and rotary convertor, while the remaining seven panels control outgoing feeders for the electrical equipment in the mill. The 3,300-V oil circuit breakers controlling this supply are of 1,000 A, while those for the various outgoing feeders are of 200 A capacity. All the breakers have a rupturing capacity of 100,000 kVA.

The machine panels are provided with differential reverse power relays of the McColl type, and the outgoing feeders with time limit overload protection, while watt-hour meters enable an accurate watch to be kept on the power consumption in various parts of the mill.

Three regulator panels for the alternator exciters are each equipped with an automatic field suppression switch, while an automatic voltage regulator is also installed.

The star points of the alternators are connected to earth through a cubicle and liquid resistance of 900 A capacity.



Three 3,750-kW turbo-alternators and a l.p. flat-back switchboard at Messrs. Wiggins, Teape & Co.'s Dartford paper mills

Low-voltage Switchboard

For supplying the power house a.c. auxiliaries and various low voltage equipment in the mill building adjacent to the power house, a 400-V switchboard of the flat-back type totals seven panels and is fed by a 900-kVA oil-immersed transformer.

As there is insufficient load during week-ends to justify running one of the turbo-alternators, a 125-kW engine-driven generator, which formed part of the old power plant of the mill, is utilised for lighting purposes. Certain of the auxiliary motor driven equipment is also fed from the d.c. supply, such as stokers, hotwell pumps, coal handling plant, extractor pumps, etc., which are required for starting up or for week-end running. Normally the d.c. is obtained from a 300 kW rotary convertor. The 210-V flat-back switchboard comprises six panels, fuses and switches from 30 to 200 A capacity.

The a.c. and d.c. low voltage panels form one complete board, made the same height as the main 3,300 V switchboard, with which they are in line.

Only nine months elapsed between the commencing of the foundation work and the first section of the plant being ready for commercial use.

Acknowledgment is made by the G.E.C. to Messrs. Wiggins, Teape & Co. (1919), Ltd., and to International Combustion, Ltd. (the main contractors for the power plant) for facilities for obtaining photographs and for permission to publish this description.

Electricity in Factories

A WHITE paper (Form 929, Stationery Office, 4d.) states that the number of electrical accidents in 1932 reportable under the Factory and Workshop Acts amounted to 313 (168 to skilled workers) compared with the previous five years' average of 380. Nineteen were fatal (fifteen skilled workers, and eleven at over 650 V); adding fifty-one deaths brought to the notice of the Factory Department but outside its jurisdiction the total of known fatalities due to electricity becomes seventy. Fourteen of these occurred on domestic premises, of which nine were due to the use of defective portable apparatus (three in bathrooms). Only accidents which disable for more than three days are "reportable." Switchgear is again the item responsible for the biggest number of accidents—ninety-seven (sixty-six below 650 V); nine were fatal (two below 650 V). Two non-fatal accidents were due to touching h.v. terminals insulated with tape, which when bent sharply or cut into by edges of nuts or rectangular busbars loses much of its insulating properties.

Defects in the insulation of cables and flexibles resulted in forty non-fatal accidents, usually due to improper maintenance or unsuitability in type or dimensions. In many cases (*e.g.*, temporary lighting) where portable apparatus not constructed of insulating material is handled in the neighbourhood of earthed metal work or conducting floors the use of small completely insulated transformers is recommended. One fatality was due to the use of an unskirted type of Edison screw-cap lampholder. For testing, a wooden box for the lamp and a couple of insulated test handles would be better than the portable (and usually broken) lampholders commonly employed.

In addition to accidents, twenty-eight reports were received of dangerous occurrences (*e.g.*, explosions or fires resulting in stoppage of machinery for not less than five hours and due to the ignition of celluloid, short-circuit, or failure of electrical apparatus).

Measures advocated for limiting the spread of oil are now more commonly adopted. The idea underlying the provision of graded granite-filled sumpage is that burning oil will be quickly absorbed and extinguished, but arrangements which involve the passage of oil through a pipe or duct to the sump are not likely to be so quickly effective as those where the sump is immediately under the oil-filled plant.

Warnings of danger to workmen are of themselves insufficient, and occupiers are required to protect workmen against their own errors or folly. This is the essence of several High Court decisions, and leads to doubt as to whether merely spacing switchgear sections is sufficient without preventing access between them.

Pole-mounted Sub-stations

There is uncertainty as to whether the smaller sizes of pole transforming equipment come under the Act. The feature in which many equipments fail to satisfy the regulations is in the assembly of an isolating switch with a fuse as one unit, without an intervening screen. Rotating radial-arm fuse mountings are among those which are competitive in price and eliminate the need for climbing facilities. Although the manufacture of luminous tubes involves high voltages, there is an almost complete absence of reported accidents in this section, due largely to co-operation of the manufacturers with the Department.

The Department has advocated the adoption of loose-coupled oscillatory circuits, providing a definite air gap between the heating coils of high-frequency heaters and other conductors, or, alternatively, the use of blocking condensers for the anode circuit rated at twice the pressure applied to the plate of the condenser.

In the application of electric welding to the fabrication of plant and structures it is no longer easy to confine the work to positions in which the arc can be screened from view. Cranemen are the chief sufferers, and coloured glass and side screens to the crane cages have been found to restrict their field of vision.

Steel Furnaces

There is evident a tendency to increase both the number and capacity of high-frequency steel furnaces, and plant capable of dealing with five-ton melts has been produced. The melt picks up a potential which depends on the resistance of the refractory liner at high temperature and its gradual disintegration. It is impracticable to earth the melt, and the liability of shock can best be minimised by providing an insulating floor round each furnace, eliminating earthed metal within the area.

Many installations of three-phase 180-cycle tools are operating satisfactorily at 110 V between phases. For the electrical stunning of animals at 70 V, the best practice is to rely upon the maintenance of good insulation of the secondary circuit of the transformer, with periodic testing. Electrified fences, such as those charged up to 230 V for killing rabbits, can be dangerous and may be considered illegal. In garages it is recommended that flame-proof fixed lighting fittings should be provided along the sides of inspection pits. Attention should also be paid to ventilation.

Several large works have installed warning lights in the neighbourhood of crane trolley conductors; these are operated by the trolley-conductor control switches, and have proved effective.

Motor Protection

A large number of cases have been found where overload protection for three-phase motor control is provided on two phases only of a four-wire system with earthed neutral; an accident resulted from faulty insulation on an unprotected phase. Frequent instances have been observed in which circuit return conductors are provided by the structural iron work; several fatalities have resulted from this practice, as the continuous and effective bonding of all parts of a structure to earth cannot always be ensured. In rural areas where no connection can be made to an extensive system of underground water mains occupiers will be well advised to measure the resistance of earth connections by suitable instruments. Properly made measurements of individual pole-line earth-plate resistances will often indicate the need for a continuous earth wire to link them in parallel. Reference is made to an explosive danger in connection with new totally enclosed motors. A large d.c. mill motor was running on temperature test and its inspection covers were periodically removed to observe commutator performance. A few seconds after the third removal a violent explosion occurred causing injuries to two men; this was due to ignition by commutator sparking of varnish fumes from the field coils. To prevent recurrence in future tests on this type of machine the supply will be switched off before removal of inspection covers, and steps will be taken to ensure the dispersion of gases before restarting.

Soviet Electrical Manufacturing Troubles

STATEMENTS in the Russian Press reveal that two electrical factories in Leningrad (Elektrosila and Elektroapparat) are experiencing considerable difficulties in their sales departments. The former have a stock of 320 completed motors of standard design on their hands because various organisations with which contracts had been concluded have not taken delivery. Difficulties have also arisen by reason of the failure of certain industrial undertakings to effect payment, and, consequently, numbers of other motors are accumulating at the same works.

A Jaroslawl motor car works has refused to accept more than half the motors which Elektrosila has made to its order, while the agricultural machinery manufacturing company known as Rostselmasch of Rostov-on-Don has cancelled its contract for the supply of electrical material. In the repairing shops of the Remmaschtrust a substantial number of motors of various types are said to have accumulated. It is also reported that several motors which were made by Elektrosila under special orders from Newchimkombinat (the Chemical Trust), Dwigatel and Bolschewik, have had to be sold to the Remmaschtrust because the contractors have decided on a different design of machine. Similarly, the soda factory Donsoda has refused to accept delivery of seven 5,000-V machines which it specially ordered.

Troubles have also arisen in connection with the execution of contracts for the railways. Some mercury rectifiers and automatic devices ordered from the Elektrosila works in connection with the electrification of the Baltic railway have been rejected by the office in Leningrad. Recently alterations in drive at various works have resulted in a sudden demand for motors of 1¾-, 2.75-, and 4½-kW capacity. Of these, Elektrosila has been able to deliver no more than a fraction of what are required, because hitherto there has been no demand for them. On account of the non-observance of contracts by various firms, Elektroapparat has large quantities of electrical apparatus of various kinds in its warehouses, the total value of which is estimated at 3,000,000 roubles. Notable among these are a number of oil-break switches and 3,000 transformers.

Isle of Man Electrification

The opening of the new transmission system

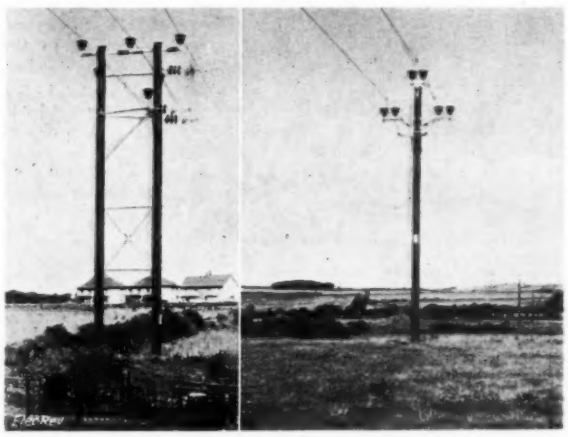
THE Isle of Man Electrification Scheme was officially inaugurated on August 3rd by the Lieutenant-Governor, Sir Claude Hill, and Lady Hill, when electricity was made available in Peel, Port Erin, Port St. Mary, and other places *en route* from Pulrose generating station. Mr. S. P. Tucker, engineer and secretary to the Electricity Board, anticipates that supplies will be given to Ramsay and Castletown next month. The scheme covers the whole island outside the important area of 17 sq. miles served by Douglas Corporation, of which Mr. Bertram Kelly is borough electrical engineer and general manager.

One of the special 33-kV transformers

The Board takes a bulk supply from the busbars of the Corporation's Pulrose generating station on the 3,300-V, three-phase, 50-cycle earthed - neutral system. The link with the Board's transforming station (250 yards away), where energy is stepped-up to 33 kV, comprises two three-core, p.i., l.s., s.w.a., 0.1 sq. in. cables laid underground. The two 500-kVA transformers are of the three-phase, oil-immersed, naturally cooled type, and feed the 33-kV busbars through fuses.

The e.h.v. system is in the form of an interconnected ring main, consisting of approximately seventy miles of three-phase lines with 0.03 sq. in. copper-equivalent s.c. shaped-aluminium conductors with earthed neutral. All insulators were designed for 44-kV working; as a result of this requirement the inter-turn insulation of the transformers had to be increased so that its strength was co-related with the flashover values of the insulators. This necessitated inter-turn insulation of each main in accordance with the provisions of British Standard Specification No. 422 for 44-kV operation. Except for the 500-kVA units, all transformers are equipped with off-load tap-changing switches on the h.v. side. Apart from the poles, which are of imported red fir, all materials employed for the electrification scheme are British.

The Electricity Board was appointed last October, following the passing of the Isle of Man Electric Light and Power Act, 1932. Its members are Messrs. A. B. Crookhall (chairman), J. R. Corren, J. J. Cowley, J. B. Kee, and W. O. Quayle. The consulting engineers for the scheme are Messrs. Kennedy & Donkin, and the principal contractors were: 33-kV transmission line transformers and switchgear, Messrs. Johnson & Phillips, Ltd., with the Standard Switchgear Co. as sub-contractors for the switchgear; low-voltage distribution systems, Messrs. John Collier & Co.; main metering equipment at Pulrose generating station, Messrs. Ferranti, Ltd.; 3.3-kV switchgear equipment at Pulrose generating station, the New Switchgear Construction Co.



A J.&P. solid junction pole and (right) straight line poles with road-crossing pole in the foreground

At the function which attended the inauguration Mr. Chas. Stewart, director of Messrs. Johnson & Phillips Ltd., presented to Sir Claude Hill a silver cigarette casket made in the form of one of the 50-kVA transformers specially designed for the scheme by his company.

A Sixteenth-century Sub-station

ENGINEERS have very frequently nowadays to erect buildings which will conform with natural surroundings. Bailiffscourt, the new house of Lord Moyne in the parish of Clymping, near Bognor Regis, dates back to William the Conqueror. The original moat and thirteenth-century chapel and some picturesque old thatched farm buildings, &c., still remain on the site, and there would have been objections to placing a modern sub-station in these surroundings.

The sixteenth-century sub-station at Clymping, Sussex

The difficulty was overcome by re-erecting a genuine 16th-century building on the site to contain the sub-station. Previously this building had been at Bignor, some ten or fifteen miles away at the foot of the Sussex Downs, and it was condemned as unfit for human habitation. When Lord Moyne decided to take a bulk supply of electricity for his new house and other buildings on the estate, the old cottage was transplanted to the new site.

Mr. Amyas Phillips, architect, and Mr. H. N. Harding, the Bognor Gas and Electricity Company's electrical engineer, thus made it possible to erect a building which is internally a modern structure, but outside is the old cottage intact and genuine throughout, its re-thatched roof being the only restoration. The oak timbers, stone walls, and "wattle and dab" panels were taken down by special methods exactly to their original shape, leaving the mortar joints and moss and vegetation undisturbed and just as they were at Bignor before removal, all repairs being invisible. As the old building had been bought for a nominal price, the extra cost of this work was, happily, quite moderate under the circumstances and the company has the use of a very useful sub-station.

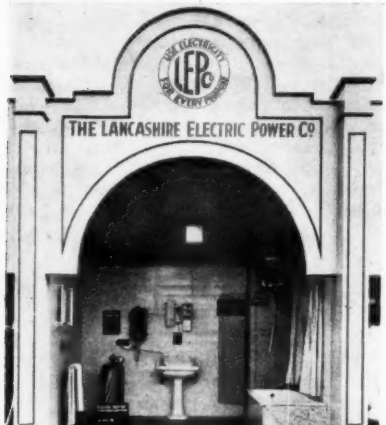
The interior contains a low-voltage switchboard by Lucy & Co., Oxford, which is screened off and locked away from the high-voltage gear. The switches were supplied by the New Switchgear Co., Ltd., of Sutton, and the 150-kW, 11,000-V, 400/230-V transformer by the Hackbridge Electric Construction Co., Ltd. An underground distributor has been laid in the same trench as the h.p. main, through the old-world village of Clymping, and every house there has taken the supply. Lord Moyne again met the company in this respect and thus made it possible to bring electricity within the reach of every cottager.

The Royal Lancashire Show

Some of the principal electrical exhibits

IN the agricultural implement and machinery section of the Royal Lancashire Agricultural Show which was held at Salford from August 3rd to 7th, there was a large number of features of live electrical interest.

The stand of the Lancashire Electric Power Company was divided into three sections, *viz.*, general domestic, bathroom, and farming.



How electricity can be used in a bathroom

In the domestic section were displayed electric fires, cookers, washing machines, vacuum cleaners, refrigerators, kettles, lighting fittings, and miscellaneous labour-saving devices of a kind likely to appeal especially to the rural dweller. The cooking demonstrations were well attended.

The model bathroom was equipped with the latest electrical conveniences, including a domestic hot-water cylinder in an ordinary cupboard with heater fitted, which was shown in operation. A special item was the "Santon" hot-water system, comprising the "Circstat" combination of circulator and thermostatic control, designed for fitting to an existing hot-water system; the cylinder is covered with special heat-insulating material. Under the Power Company's central scheme an entirely automatic and constant supply of hot water can be ensured at all the usual taps throughout the year without the dirt, labour and inconvenience of the coal fire; the heater is installed free (including up to 30 ft. of wiring and maintenance) at 5s. per quarter.

A Model All-electric Poultry Farm

Considerable interest was displayed in the model electrified poultry farm. The farming exhibits included a "Wrennal" radiant hover, a "Manifold" incubator with a capacity of 2,100 eggs, "Day-o" battery brooders for chicks aged from one day to one month, "Month-o-Ward" battery brooders for chicks from one month to twelve weeks old, and churns, milk-separators and pumps driven by portable electric motors. Visitors to the stand remarked on the strong and healthy appearance of the chicks which were on show. The birds were obtained from an all-electric farm on the Company's supply.

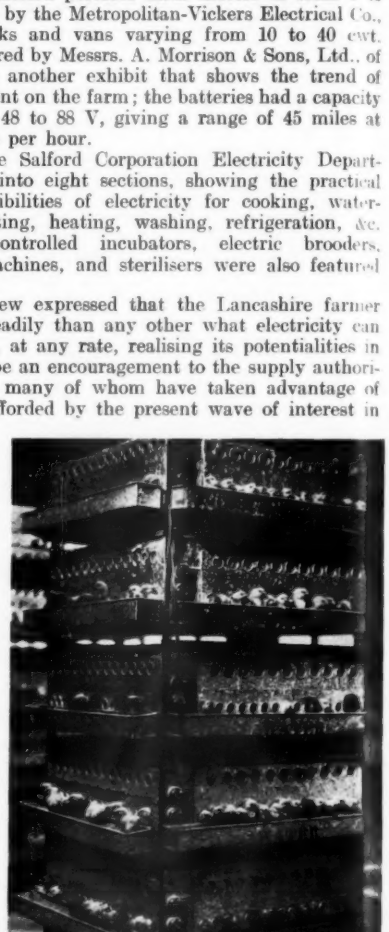
There was also shown a G.E.C. egg-tester, sterilising chest, soil-heating cable, and the "Magnet" portable groomer specially designed for grooming horses, cattle, dogs, &c.; by means of special attachments this appliance can also be used for general cleaning operations.

Battery Vehicles

Two- and four-wheeled portable farm motors of from 5 to 15 h.p. were shown by the Metropolitan-Vickers Electrical Co., Ltd. Battery trucks and vans varying from 10 to 40 cwt. loading, manufactured by Messrs. A. Morrison & Sons, Ltd., of Leicester, provided another exhibit that shows the trend of electrical development on the farm; the batteries had a capacity of 220 Ah at from 48 to 88 V, giving a range of 45 miles at a speed of 15 miles per hour.

The stand of the Salford Corporation Electricity Department was divided into eight sections, showing the practical and economic possibilities of electricity for cooking, water-heating, shop lighting, heating, washing, refrigeration, &c. Thermostatically controlled incubators, electric brooders, hovers, milking machines, and sterilisers were also featured there.

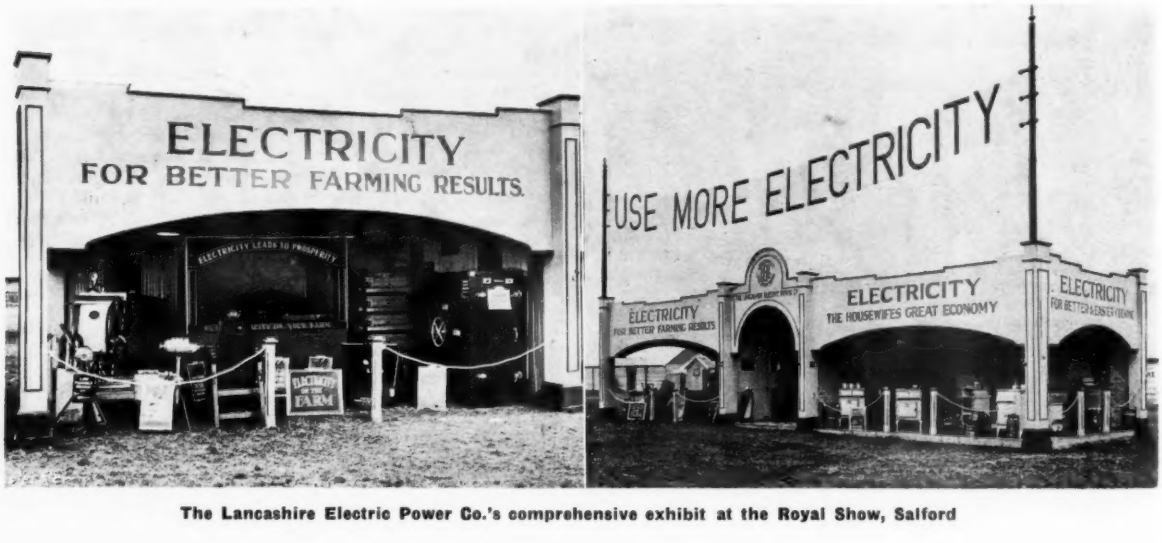
We heard the view expressed that the Lancashire farmer appreciates more readily than any other what electricity can do for him. He is, at any rate, realising its potentialities in a way that should be an encouragement to the supply authorities in the county, many of whom have taken advantage of the opportunities afforded by the present wave of interest in electrical methods to bring home to him that electricity has many applications other than lighting and the popular portable motor.



An electrically controlled brooder

Although glass-house horticulture has not hitherto provided much of a field for electrical exploitation, the considerable developments of this method in Lancashire is worth watching by manufacturers as well as supply undertakings.

The exhibition has attracted a large number of urban visitors also, and these will not be slow to draw the conclusion that what is useful to the country dweller will in many cases be equally applicable, with minor adaptations, to other conditions. In spite of the storm a few days before the opening of the show, which wrought some havoc, the arrangements were well up to time.



The Lancashire Electric Power Co.'s comprehensive exhibit at the Royal Show, Salford

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Rateable-value Charge

"Domestic Consumer's" letter of July 25th should be printed and distributed among the officials of the entire electricity supply industry. It is difficult to imagine a more inequitable means of doing business than by the variable two-part tariff method, because however carefully applied it must mean that some consumers get their electricity very cheaply, others pay a much higher average price, and others must either pay through the nose for it, or be denied the use of it.

I write with nearly twenty years' experience, and know the experts will rise up in unison against me, but let it be remembered that experts are sometimes in error. Yet the conviction is growing with me that if a gas undertaking can sell its gas at so much per therm, if a baker can sell his bread at so much per loaf, and both make a profit, then electricity can be sold at so much per unit without a hindering fixed charge and yield a handsome return.

In principle there is no difference between a baker's business and an electricity supply business; it is only that we like to think there is. Why does not the baker level a fixed charge?

If it is desired to encourage the use of electricity, introduce the sliding scale; there is great fascination in nearing the cheaper rate.

I have some friends who are quite keen on the all-electric house and revel in using electricity at every turn, yet they cannot do this now because the fixed charge is prohibitive. They are using gas for lighting and cooking because the electricity supply authorities understand so little about business they prefer to quote a silly price and do no business.

Unless the electricity supply concerns in this country rapidly adopt a much more willing and progressive attitude we shall certainly be left behind by our friends the gas authorities, whose advertisements one meets almost daily.

August 7th. SALES ENGINEER.

While sympathising with "Domestic Consumer" in his remarks about the injustices of the two-part domestic tariff, his method of dealing with them seems very much like "cutting off his nose to spite his face." He may, theoretically, be saving £2 per annum, but the inconvenience, dirt and extra labour caused by coal fires and cooking, will, no doubt, cost him far more than £2 annually, even disregarding the extra labour to which his wife must undoubtedly be put. There is nothing like electricity for the home even if it were more expensive than other forms of fuel, which it is not.

My opinion of the two-part domestic tariff of which I have taken advantage for a number of years, is, and always has been, that while it encourages me to use electricity *ad lib.*, owing to the small charge per kWh, the standing charge is an anomaly.

In ordinary business life a big consumer receives special consideration, but in the two-part domestic tariff he is penalised. Obviously the larger the house the more will be the electricity used, and *vice versa*. I can quite believe that in small houses the amount of electricity used is so small that the cost, plus standing charge, results in a loss to the supply undertaking, for which big houses have to pay.

I would advocate one of the following three policies to regulate matters: (1) Total abolition of standing charge; (2) a standard standing charge, irrespective of size of house; or (3) a standing charge in inverse proportion to size of house.

London, E.C.2, *August 4th.* S. F. SHERIDAN.

Advice to Intending Engineers

There is one remark in "Hadsum's" excellent and important letter that may be usefully commented on, *viz.*, "These remarks have to be but little modified in the case of public concerns rather than private companies."

I assume he refers to municipal concerns. Although the remark is fully justified, the remedy is very simple and depends on the ratepayers. Sixty years' study of municipal methods enables me to say that the wrong men are elected by the active electors, and that this is due to the apathy of the majority, who, if you try to rouse them, shrug their shoulders and say "what's the use?"

It is suggested that more stringent control should be exercised during the elections, and some form of guarantee demanded that all personal action be devoted to the public good.

As an instance, take electricity supply. The total L.A. surplus (April 7th, 1932) was nearly 3¼ millions. It is a public service, and should therefore be under municipal control for the benefit of the ratepayers in common. But to overcharge consumers, who so far are only a portion of those ratepayers, is not "benefit in common." At Ayr, in 1895-6-7, the suggestion was accepted by the lighting committee that the works accounts should be made to balance and any surplus or deficit dealt with in the following year's accounts. The works, thus being free from profit, could be dealt with as a non-rateable concern. To take money from one pocket only to put it in another, and the latter without just claim to it, savours of dishonesty.

There is no valid reason why municipal services should not be so dealt with, and the legislation required, being solely on points of equity should be very simple. The result would, or should at any rate, be far-reaching. When those who are now seeking municipal membership have no longer any personal benefit available from it, they will leave the job to those who have no private ends to serve. Even if we cannot legislate for making people good, we can at any rate deprive them of all personal benefit, and leave the result to time. Political and municipal jobbery exist solely because it is nobody's business. Correct legislation would *make it somebody's business.*

London, S.E.12, *August 5th.* E. G. PINK.

Round or Flat Plugs?

I have read with great interest, but considerable surprise, Mr. Willis's article *re* standard plugs and sockets, and should like to make a few observations with regard to his contentions.

The subject of "round or flat pins" threatens to become as controversial as that of "earth or insulate" and one or two other matters. This question has been simmering in the background for some twelve months or so, but each time it has been dragged into the daylight for discussion by any trade associations, manufacturers' associations, or technical committees drawn from either or both of the above, sufficient information on the subject has been brought forward to leave no doubt among those present that the adoption of flat-pin type plugs and sockets would be a really retrograde step. The flat-pin plug (as a standard) has also on such occasions been looked on as therefore "dead and buried."

Steady nerves are needed by these workmen who are fixing guard wires beneath a power cable crossing a main road at Narberth, Pembroke

Mr. Willis opens his remarks by a reference to an "0.005 tolerance," etc., in the Standard Specification, but has unfortunately overlooked the very important revision which was much advertised at the time of its publication at the end of last Ferbuary. Briefly this revision abolished any dimensions on socket tubes and stipulated that they should be "self-aligning as to *pitch* and *contact* making" or words to that effect. No such tolerance as Mr. Willis mentions between pin and socket now exists.

Mr. Willis contends that circular pins are only possible in theory and suggests that flat pins are conversely easily possible in practice. "What is good for the goose is good for the gander too," and as a manufacturer I would much prefer to make a smooth circular pin than a theoretically (and I suppose, optically ground) smooth flat pin. Unless great expense is incurred, there is more chance of line or point contact with so-called flat pins than with so-called round ones, especially

in view of recent developments of various types of spring contacts. One must also bear in mind what Mr. Willis refers to as "the price at which it must be produced." What about the question of parallel alignment between flat pins and their socket clips? It has already been conceded by several of the few advocates of flat pins that the February amendment of B.S.S. No. 372 now, for all practical purposes, removes the cause for criticism which existed. This amendment also meets Mr. Willis's criticism *re* efforts to put spring pressure in the socket tube at the expense of axial alignment. The axial alignment is now obtained by the "floating effect" or "alignment as to pitch." The adjustment for contact is nowadays obtained by spring controlled two-piece tubes which will make good contact on old or new, high or low limit, solid or slotted pins.

Incidentally, the "springy" nature of the sockets is not nowadays obtained by "high-speed turning brass." It is obtained by *other parts* than the tube itself, which are generally made of highest grade bronze. Mr. Willis states that "metal used for mass production has no spring in it," but later in his article quotes the "flat contacts of switches and fuses as giving no trouble." If the flat pins and their sockets are to be "solid metal" and "not pressed," why quote switches and fuses at all? Moreover, "solid metal" presumably implies machined surfaces (? expense), and one has even then to provide a resilient connection to the terminal in order to achieve the very necessary self-alignments for pitch and contact.

Speaking again as manufacturers, our experience is that as regards fuses, the "plug-in" pin type of contact is very rapidly gaining great favour and is much preferred to the clip type.

Regarding interchangeability arresting progress in design, all B.S.S. are so drawn up as to avoid such a contingency, and I fear Mr. Willis will not find much support for his statement that design is hampered by "any such standardisation." The present B.S.S. No. 372 deals only with features necessary for interchangeability and a few essentials based on considerations of safety. The number of B.S. plugs and sockets on the market and their various characteristics are surely sufficient answer.

Another contention which is difficult to follow is Mr. Willis's statement that "certain adaptors are the best cable overloaders one could devise; no engineer would consider their use." Such a statement has a lot to be said for it, but later on comes the remark that "the 15 A plug top has accommodation for the 5-A fused plug so that a radiator and a small appliance can be used at the same time, and is therefore highly commended by Mr. Willis. I should be interested to know whether Mr. Willis is aware, in his official capacity, of either of the two very official and authoritative groups of tests (one of them is not British) which show the definite mechanical and electrical superiority of the present day round pin and self-aligning sockets over the typical flat-pin type of plug.

Incidentally the sockets of the flat-pin types are not self-aligning as to pitch and as to contact surfaces.

I am certain further ventilation of views on this subject will be of very wide interest, especially to firms who, like ourselves, make round-pin plugs and also (against our better judgment for certain markets) flat-pin plugs. J. B. TUCKER.

Veryan, Cornwall, *August 3rd.* J. H. Tucker & Co., Ltd.

Overseas Applications for Appointments

I note in your issue of July 7th that reference is made to a letter received from a reader in New Zealand who finds that the closing dates for applications for employment are such that it is not possible for him to enter.

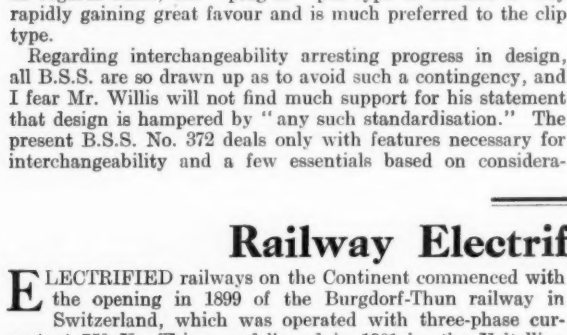
I, personally, have experienced exactly the same trouble and though by using Air Mail I could get applications to England within three weeks of publication, such applications would arrive too late for most of the recent advertisements for which I consider myself qualified. G. S. A. HANNELL,

Chief Electrical Engineer,

Khartoum, *July 18th.* Egyptian Govt. Immigration Dept.

Railway Electrification in Europe

ELECTRIFIED railways on the Continent commenced with the opening in 1899 of the Burgdorf-Thun railway in Switzerland, which was operated with three-phase current at 750 V. This was followed in 1901 by the Valtellina line in Italy, but the Italian Government did not commence its electrification work until 1912, the initial effort being a seven-mile section between Pontedecimo and Busalla, which was converted to the three-phase system. It is only in the last five years that the Italian State Railways have used anything but three-phase current, although the system has found little favour elsewhere. It has recently been improved on the Rome-Avezzano line by using a pressure of 10,000 V in conjunction with a frequency of 45 cycles, the traction motors here driving the wheels through geared jackshafts, instead of directly as in the 16.6 cycle system.



An early Hungarian steam engine alongside the latest split-phase electric locomotive

The Central European countries keep to single-phase current for main-line work, Switzerland, Austria, and Germany all possessing extensive systems at 15,000 V, 16.6 cycles, which permit of inter-running where the tracks are connected. The Hungarian State Railways have recently adopted the Kando split-phase system, in order that single-phase current at industrial frequency may be supplied to the contact line, the three-phase 110-kV supply being transformed to single-phase 16,000 V, 50 cycles at the sub-stations and then converted to 1,000 V polyphase by a phase-convertor on the locomotives. The Austrian Federal Railways are now trying out a modification of this principle, but the remaining single-phase countries, *viz.*, Switzerland, Germany, Norway and Sweden, use commutator motors, and keep the frequency of the line current at 15-16.6 cycles.

France possesses a large mileage of d.c. lines, including practically all the main routes of the Midi Railway, and two of the principal divisions of the Paris-Orleans Railway. Except for the Paris suburban lines of the State Railways, electrification is exclusively at 1,500 V d.c., and the benefits of this standardisation will soon be felt when the Paris-Orleans and Midi electrified lines are linked up. The same system has been adopted for the lines recently opened, or now under construction, in Belgium, Denmark, Holland, Esthonia, and Czechoslovakia, and to a lesser extent in Poland and Russia.

The electrified route mileage of European railways now amounts to some 8,500 miles, and although in some cases, *e.g.*, Germany and Switzerland, electrification has been pushed forward as a means of relieving unemployment it has never failed to improve the operating conditions appreciably. Where energy for the railways can be generated in a public supply station, it provides a steady and economical base load.

Electrified Railway Mileage in Europe (to end of 1932 unless otherwise stated)

Country.	Total route miles open.	Route miles electrified.	Route miles, under conversion, or projected.	System of electrification.
Austria	4,400	547	306 UC 50 P	SP, 15 kV, 16.6 c.
Belgium	5,900	9	30 UC	DC, 1,500 V.
Czechoslovakia ...	8,400	29	—	DC, 1,500 V.
Denmark	3,300	—	16 UC	DC, 1,500 V.
Esthonia	900	5	—	DC, 1,500 V.
France	33,300	1,346[1] [2]	412 UC 264 P	DC, 1,500 V.[3]
Germany	36,450	1,130	100 P	SP, 15 kV, 16.6 c.[4]
Great Britain ...	20,409	563[5]	—	DC, 600, 1,200 and 1,500 V[6]
Holland	2,325	109	12 UC	DC, 1,500 V.
Hungary	5,950	171	53 UC	SP, 16 kV, 50 c.[7]
Italy	14,000	1,610[8]	2,172 P	TP. DC.[9]
Norway	2,410	144	—	SP, 15 kV, 16.6 c.[10]
Poland	13,400	138	216 P	DC, 1,500 and 3,000 V.
Spain	10,350	553	115 P	DC, 1,500 and 3,000 V. TP, 5,500 V, 25 c.
Sweden	10,380	1,265[11]	195 UC 380 P	SP, 16 kV, 25 and 16.6 c.
Switzerland ...	3,120	1,694[12]	100 UC	SP, 15 kV, 16.6 c.[12]
U.S.S.R.[14] ...	51,400	170	1,800 P	DC, 1,500 and 3,000 V.

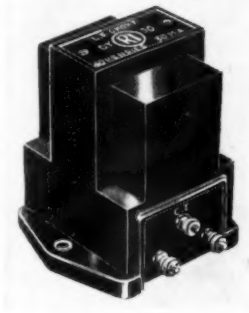
[1] To May, 1933. [2] A further 60 m. worked by battery traction. [3] 78 m. at 650 V d.c. [4] 170 m. at 650-1,000 V d.c. [5] Excluding underground. [6] 9 m. at SP, 6,600 V, 25c. [7] Split-phase system. [8] Incl. Bologna-Florence direct. [9] 203 m. at 3,000-4,000 V. d.c.; 64 m. at TP, 10 kV, 45 c.; 910 m. at TP, 3,600 V, 16.6 c. [10] 28 m. at SP, 10 kV. [11] Incl. Stockholm-Malmo, to be compl. 1933. [12] Exclusive of rack railways. [13] 70 m. d.c. [14] Incl. Siberia and Turkestan.

The Radio Exhibition

Olympia's annual spur to the wireless trade

NEXT week (August 15th to 24th) Olympia will become once again the shop window of one of England's most rapidly developing industries. Registered broadcast listeners have increased by a million during the past year, the number of receiving licence holders at the end of June being 5,598,000. Details are given below of some of the more interesting exhibits.

AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.—The "Avominor," introduced for the first time, is a moving-coil combination measuring instrument, entirely self-contained, light and compact, 4 in. by 3 in. by 1¾ in. and measures current, voltage, and resistance. The retail price is 40s.



"R.I." l.f. choke

A new longer model of the "Avodapter" enables valves and valve circuits to be tested externally. The plug can be inserted easily in sunken valve sockets, and the lead leaves the plug at a more convenient angle than hitherto. The current switch has been altered so that all circuits, except filament or heater, can be connected in series with a milliameter. There are other refinements, but the price remains at 25s.

Automatic coil-winding machines exhibited include two new models. The Douglas "Criss-Cross" coil machine, which can be power or hand driven, winds self-supporting wave-wind coils from 2/32 in. up to approximately 1¾ in. of covered wire from 46 to 20 s.w.g. One, two, three or four coils may be wound simultaneously, as the wire reel carriers form separate units and each can be independently adjusted.

The new "Multiple" winder is power-driven and designed for winding small coils from 1/8 in. to ¾ in. in width, one, two, three, or four simultaneously according to size, with wires of 48 to 34 s.w.g. It is fitted with a specially constructed motor, operated by a foot pedal, and capable of running at 6,000 r.p.m., which forms the winding head. An adjustable back-centre supports the winding mandrels, and the wire guide arms are fitted with a special lateral adjustment.

BRITANNIA BATTERIES, LTD.—This range of "Pertrix" dry batteries is claimed to be the only type in which a neutral electrolyte is employed. Sal-ammoniac is not used, so that the zinc cell containers are not attacked when the battery is not in use, thus tending to lengthen the life of the cells. Tapped batteries are made for anode and grid-bias circuits in the usual sizes at competitive prices, including special types for Class B amplification and q.p.p. circuits. In the latter case a g.b. portion is included in the carton, but it is not electrically connected to the high-voltage battery proper. A range of accumulators is also available in glass, celluloid, and ebonite boxes. Type "PLb" has no separators, the plates being held in position by grooves in the glass container.

BRITISH BLUE SPOT CO., LTD.—A special feature is being made of extension speakers this season, for use away from the receiver. Balanced-armature and moving-coil types are supplied in both chassis and cabinet forms, prices ranging from 12s. 6d. to 87s. 6d. All m.c. models are fitted with output transformers with terminals or plugs and sockets to facilitate valve matching. They are suitable for all usual outputs, including Class B, but q.p.p. pentode models must be ordered specially and cost 2s. 6d. extra. The cones and speech coils are specially treated to avoid moisture trouble and prevent warping or fouling in the air gap. Cabinet models contain an independent baffle, to which the driving movement is attached, while moulded dust-proof side-plates exclude foreign matter from the gap.

A mains disturbance eliminator is available at 10s. 6d., and the 35s. gramophone pick-up has a rotating head, wire-wound volume controller, and a frequency response from 30 to 4,000 cycles.

BRITISH THOMSON-HOUSTON CO., LTD.—The 1933-34 season's range of electric gramophone motors consists of four models. The "Truspeed—AC" model operates on 100- to 250-V 50-cycle circuits; its current consumption is 6 to 8 W, and the synchronous motor does not require to be started by hand. The speed is electrically controlled, and it has an automatic stop switch. The retail price is 49s. 6d.

The "Truspeed—DC" motor is an entirely new 67s. 6d. model for operation at 100/250 V. A speed governor and regulator ensures constant and correct speed.

The "Golden-Disc" is a de luxe model sold at 67s. 6d. The induction-disc motor can be operated on 40/50 cycles a.c. single-phase between 100 and 250 V. An added refinement is the automatic "start" and "stop" switch, which operates immediately the needle ceases to travel towards the centre.

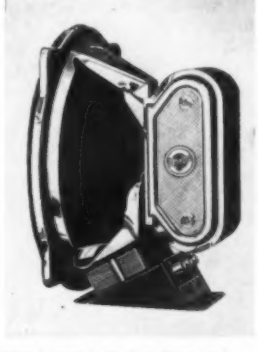
The "Universal" operates at voltages between 100/250 d.c. or 100/250 a.c., 25/100 cycles. The retail price is 110s.

CARRINGTON MANUFACTURING CO., LTD.—This manufacturer of woodwork of every description specialises in scientific case work. Many of its radio cabinets are of registered design. The new "Camco Argyll," for instance, is a vertical pattern table cabinet for a receiver and loud speaker, the inside dimensions being 18 in. high, 16 in. wide, and 10 in. deep. It is walnut veneered throughout and contains a baffle board with a 6.5 in. hole, back, 16 by 10 in. base, and a shelf, the price being 38s.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—The range of "Drydex" dry batteries has been enlarged. To the "Red Triangle" series three new types have been added: No. 1067 at 10s., is a 99-V battery plus 9 V for grid bias; No. 1068, at 12s. 6d., is for 123 V plus 9 V g.b.; while No. 1069, at 11s., is for 126 V. The "Green Triangle" series is increased by the introduction of Type H1052 at 15s. 3d. for 108 V. The "Blue and Yellow Triangle" series, covering batteries for portable receivers, now includes types for every well-known receiver, the additions to the "Yellow" range being assembled with cells of extra capacity designed particularly for q.p.p.

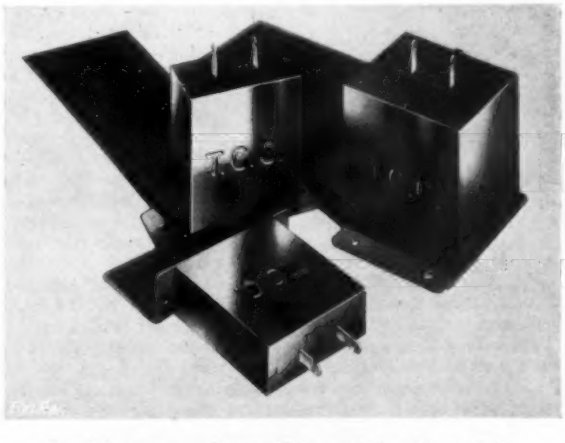
There are four categories of "Exide" low-voltage filament accumulators. Series "C," in celluloid and glass containers, has a capacity range from 6 to 120 Ah. The "D" mass type which holds its charge for long periods includes the "DXG," which is specially made for sets in which the height of the battery space is limited. Gravity head indicators are obtainable as an extra.

The de luxe type "HZ" is suitable for heavy discharges and unspillable cells are available for portable receivers. Among the "Exide" high-voltage anode accumulators is the "WY10" for heavy current multi-valve work, and they are also obtainable in 60-V units in specially designed polished wood crates for stacking.



Moving-coil loud speaker (British Blue Spot Co.)

J. J. EASTICK & SONS.—Apart from the extensive range of "Eelex" plugs and sockets, terminals, and connectors of many kinds, short-wave convertors are featured. These are not adaptors, but frequency changers on the superheterodyne principle for preceding the normal receiver and converting it for short-wave operation. The oscillator used may be a separate valve or the first detector may combine the two functions. Self-contained cabinet models are available for a.c. mains or battery sets, as well as a complete chassis for building into existing receivers.



Special paper condenser (Telegraph Condenser Co.)

A modulated oscillator in cabinet form, with tools and testing instruments, is made for dealers and service work.

A new connector makes good contact when inserted in

battery sockets of different sizes. The diameter of the split prong can be varied by turning the wire-retaining grub screw beyond the point necessary to grip the conductor. Another new item is an anode connector for screen-grid valves, which, being completely insulated, provides immunity from short-circuiting. Enclosed in an insulating sleeve is a metal socket, one end of which is threaded to replace the top terminal of the valve.

ELECTRO DYNAMIC CONSTRUCTION CO., LTD.—Rotary convertors fitted with a rheostat and voltmeter to enable any receiving set of from 40 to 200 W to be operated at the correct a.c. voltage are priced at £22 15s. A similar machine, but with a maximum output of 90 W, is obtainable for £17. Convertors are also made suitable for operating at any d.c. voltage from 100/125 to 200/250 V with a maximum output of 200 W for £29 10s.

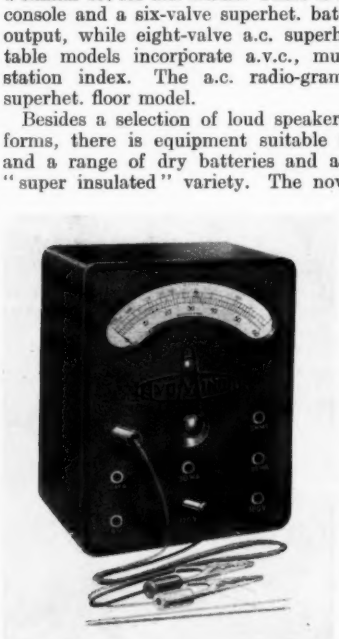
FERRANTI, LTD.—The "Gloria" superheterodyne receiver is available in four models. It is highly selective, giving 9 kc station separation and an undistorted output of 2.5 W. Pentode h.f. amplification is used and double-diode-triode valves made by the company itself. Automatic and manual volume control is provided, and one-knob tuning by station name and wavelength, with electric indication. A moving-coil speaker is incorporated in the walnut cabinet with provision for a separate speaker and gramophone pick-up. The console is priced at 29 guineas and the consolette at 24 guineas or 26 guineas when a synchronous electric clock is incorporated.

The top of the handsome "Gloria" companion, at 35 guineas, can be used as an occasional table. The speaker is at one end and the controls are hidden beneath a panel at the top, which may be depressed when it is desired to actuate them.

The small "Arcadia," using fewer valves, costs 18 guineas. The "Lancastria" costs 15 guineas, and all these sets are 200/250-V 40/100-cycle a.c. mains driven, except the clock consolette, which is limited to 50-cycle time-controlled frequency supplies.

GENERAL ELECTRIC CO., LTD.—The principal receivers include an inexpensive three-valve set fitted with a moving-coil speaker and self-contained batteries. An a.c. table model five-valve superhet. incorporating tone control, speaker switching, and tuning by station names is offered at a popular price, and also a similar set for d.c. mains. There is a five-valve a.c. superhet. console and a six-valve superhet. battery model with Class B output, while eight-valve a.c. superhet. console and de luxe table models incorporate a.v.c., muting, and an attractive station index. The a.c. radio-gramophone is a five-valve superhet. floor model.

Besides a selection of loud speakers in cabinet and chassis forms, there is equipment suitable for public address, &c., and a range of dry batteries and accumulators of the new "super insulated" variety. The novel a.c. "Catkin" valve will be in evidence and all current glass types. An addition to the two-volt range is the new double-triode for Class B amplification, B21. In the a.c. mains range (with indirectly and directly heated filaments) are the latest types of multi-electrode valves such as double-diode-triode MHD4, and the new high-frequency screen pentodes MSP4 and VMP4. A new power pentode in the directly heated series, PT16, should also be of interest.



"Avominor" moving-coil combination measuring instrument

The d.c. valves include also a barretter, or current regulator, suitable for use with the 0.25-A d.c. valves.

HARLIE, LTD.—The "Fix-a-Gram" consists of an a.c. motor-driven turntable and pick-up assembled ready for use in a cabinet measuring 9 by 13 by 16 in. and priced at £5 15s. An adaptor is also available for converting a radio set. It is similar to a valve holder.

Other components are a tone selector and scratch filter, a rotary snap-action radio-gram. change-over switch, an automatic stop switch, besides microphones and several models of pick-ups.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Among wires and cables of all kinds is a special "slide-back" wire very suitable for mass-production work. No cutter is needed to strip the insulation from the ends.

In addition to the "Solon" 55- to 65-W soldering iron, priced at 7s. 6d., a new "Empire" model at 10s. has been introduced for industrial use. Its loading is only 70 W, and the bit (straight or angle) is designed for working in a limited space and for preventing flux from penetrating to the heating element, which is totally enclosed in the bit. The handle is fitted with a patent "Bakelite" terminal box and cord grip.

Resin cored solder consists of a tube of alloy with resin filling which melts out when the solder is heated and acts as a flux during the operation of soldering. It conforms to British Standard Specification No. 219 (Grade F, 13 S.W.G., 50 per cent. lead, 50 per cent. tin), and is supplied in 6d. reels and 1-lb. and 7-lb. cartons.

MARCONIPHONE CO., LTD.—Typical of the larger new instruments is Model 291, which is a seven-valve all-electric superheterodyne radio-gramophone with delayed automatic volume control, effective on signals exceeding a predetermined strength, but allowing full amplification for very weak signals; this gives constant volume through a 400 to 1 variation in the strength of signal.

Ferranti "Gloria" clock consolette

The valve arrangement consists of a non-radiating variable-mu h.f. stage, triode oscillator, variable-mu mixer, screen grid i.f., diode metal rectifiers for second detection and a.v.c. followed by an l.f. stage, super power output and heavy duty valve rectifier. The overall sensitivity is manually adjustable by a unique static suppressor which is set at a convenient signal to noise ratio and switched out when full sensitivity is required.

Separate tuning scales are provided for medium and long waves; the manual volume control is linked with the static suppressor on-off switch, and the tone control is of the duplex type, correcting either base or treble with a central position for straight-line response.

The automatic playing mechanism takes eight records, rejecting at will and switching off automatically at the end of the programme. Among refinements is an improved response energised moving-coil inclined speaker. The maximum output is 2¼ W (enough for three extra speakers), and the maximum consumption 110 W.

Among battery sets is the four-valve model 260, priced at £11 17s. 6d., which utilises a variable-mu screen-grid stage, power grid detector, and dual pentode output (parallel conductance principle) circuit; an improved version of the quiescent push-pull system, whereby the operating conditions of each output valve are automatically balanced according to the shape of its characteristics; this ensures uniform reproduction at any volume from audibility to maximum. The speaker is a new p.m. moving-coil, other refinements being balanced band-pass tuning, distortionless volume control, provision for extra speakers and pick-up, and three alternative aerial connections. The undistorted output is 1.3 W maximum, and the average h.t. current consumption 9.0 mA.

Model 255 M/C is a new superhet. six-valve portable receiver, priced at £14 14s.

MCMICHAEL RADIO, LTD.—The suitcase-pattern portable receiver incorporates a moving-coil speaker and four-valve double gang tuning circuit, the scale resembling an ammeter dial. Automatic grid bias dispenses with a separate battery. The hide case has nickelled fittings, and the price is 17 guineas. The "Twin Supervox" costs a guinea more, but it has two m.c. loud speakers which are mains energised. This a.c. set is non-oscillating, non-radiating, and reactionless. Band-pass and l.f. tuning is by a triple ganged condenser operated by one control only.

There is a cabinet-type transportable battery set at 15 guineas which is entirely self-contained with frame aerial and m.c. speaker, while the "Duplex Four" is a table cabinet which can be moved from room to room, as it needs no aerial or earth, simply plugging into a.c. mains.

The "Lodex" is a very powerful battery set, priced at 16 guineas. Class B amplification is embodied, there is only one tuning knob, and selectivity is enhanced by the use of coils with magnetic loading. Reaction is not employed, and a special double-peaked choke is the subject of a provisional patent.

The "Super Five," at the same price, is a self-contained battery set with a built-in frame aerial and an additional low-frequency amplifying stage to drive the Class B output valve.

RADIO INSTRUMENTS, LTD.—A new type of coil for aerial and tuned grid circuits utilises two "Bakelised" dust-iron cores for increasing selectivity. When in use the wave-range of the coil may be preset by means of a screw permeability adjustment to obtain agreement with existing dial readings. Aerial tapping terminals are provided, and when used in the l.f. and detector circuits a pair of these coils may be accurately matched by the screw adjustment. The two wavebands covered are 200 to 600 and 1,000 to 2,000 metres. An independent winding is incorporated to allow of the use of a reaction condenser in any position in the circuit. The unit is screened and its small dimensions are made possible by the "Micrion" alloy core, a contributory factor to its efficiency being the use of "Litz" wire for the medium-wave coil, *i.e.*, a number of independently insulated copper conductors made up in the form of a strand, the whole being insulated with silk covering.

These new coils are fitted in the "Madrigal" three-valve mains-driven table model receiver, while the four-valve battery set has Class B amplification. The new superhet. radio-gramophone utilises six valves, including the rectifier and intermediate oscillator. A triple ganged tuning condenser controls the dual preselector and oscillator circuits. The intermediate band-pass-coupled stage feeds into the second detector, which provides amplified automatic gain control for the preceding circuits. Provision is made for regulating the general sensitivity and for noise suppression.

There is also a new 40-henry 30-mA low-frequency choke, and the "Hypermu" transformer is now enclosed in a different type of "Bakelite" case, while its price has been reduced from 21s. to 15s. 6d.

RONNIE ENGINEERING.—Among the "radio necessities" made by this concern is a substantially constructed earthing tube of perforated heavy-gauge copper with a solid gunmetal ferrule at the lower end and a gunmetal casting shaped like a funnel at the top end for collecting moisture above ground. The price is 5s. for standard finish and 6s. for the cadmium and nickel-plated model for use in corrosive soil.

The tube is filled with crystals compounded of four minerals which produce hygroscopic action. The crystals are packed in waterproof containers priced at 1s. 3d. each.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD.—The main feature of this imposing exhibit is the "Full o' Power" radio battery, which is of uncommon design and construction.

Four types of dry radio battery are made: the low-priced "Cadet" for 6-7 mA discharge, the "Standard" type for 10 mA, the "Power" type for 10-20 mA, and the "Super-Radio" type for 20-30 mA. For Class B amplification the "Power" type is recommended on account of its low internal resistance, but those who may find its bulk and weight inconvenient have an alternative in the No. 1168 "Full o' Power" 120-V double-capacity battery.

TELEGRAPH CONDENSER CO., LTD.—A new product in the form of an anti-interference unit is making its appearance for the first time. It consists of condensers and fuses in series contained in a moulded insulating case. The condensers are designed for working directly across domestic supply mains. The unit will retail at 9s. 6d. complete.

Among electrolytic condensers are a small tubular dry type for grid-bias purposes and the well-known 8-mfd. aqueous type for smoothing in all-mains receivers.

TELEPHONE MANUFACTURING CO., LTD.—This range of "Hydra" brand condensers, which are made entirely in England, includes all sizes from 0.1 to 10 mfd. capacity, suitable for use at voltages of from 250 to 750 d.c. They are available at corresponding prices, ranging from 1s. 6d. to 26s. each. The display includes T.M.C. toggle switches for coil and battery switching.

WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.—Two new rectifiers are priced at 17s. 6d. The H.T.12 supersedes the old models H.T.6 and H.T.7, and will give an output of 30 mA at 200 V, being suitable for small mains receivers and the excitation of moving-coil loud speakers. H.T.13 has been specially designed for the anode circuits of q.p.p. and Class B receivers.

Of special interest are the battery and a.c. mains superheterodyne receivers designed by this company. They incorporate the "Westector," and the a.c. model also uses a metal rectifier for the power supply and automatic volume control. Built on a metal chassis, and using "Catkin" valves, this constructor's set is the first "all-metal" superheterodyne. It is selective enough to receive Continental stations, even when used in a "swamp" area. A further point common to both the mains and battery sets is the use of the last i.f. valve as a first l.f. amplifier when the set is used in conjunction with a gramophone pick-up.

The battery version uses two "Westectors," the second acting as a battery economiser. With a maximum undistorted output of 1,100 milliwatts, the standing current of the output stage is 2 mA only, while the mean current averages 12 mA.

LISSEN, LTD.—To the "Skyscraper" kit series is added a universal q.p.p. four-valve kit priced at £5 12s. 6d. and a superhet kit for £8 17s. 6d., both complete with valves. Other additions are a very light portable set with Class B amplification and an m.c. speaker, a two-valve battery set in an oak cabinet for £3 19s. 6d., and a receiver for use in motor cars.

After London the whole show will be transferred to Glasgow (September 1st to 9th) and then to Manchester (September 27th to October 7th), the ambition of the trade being to raise the total licences issued to six million by Christmas.

The Argentine Electrical Market

IN his latest report upon conditions in Argentina to the Department of Overseas Trade (Stationery Office, 5s. net) Mr. Stanley G. Irving, Commercial Counsellor at the Buenos Aires Embassy, says that although the prices for Argentine products remained low and the markets were severely curtailed by artificial restrictions, the Republic was able to show a favourable trade balance, an improved Budget position, and a clean record in respect of external debt service.

Mr. Irving devotes more space than is usual in these reports to electrical trade matters. He says that the two large electricity supply companies in the capital have about 200,000 kW of new plant available, and it is expected that there will be a considerable development in the sale of current-consuming and distributing equipment.

In 1931 less than 4 per cent. of this trade was done by the United Kingdom, by far the largest share going to the United States and Germany. Out of a total value of current-consuming appliances exported by the United States in 1930 amounting to $5,585,000 between 6 and 7 per cent. went to Argentina. A serious disadvantage under which British manufacturers labour in the marketing of electrical accessories is that while in the United States and Germany there are certain large combines covering the whole field of production, in the United Kingdom production is scattered among numerous separate manufacturing firms selling independently. The competitive power of the United Kingdom industry would be greatly increased if an arrangement were made for the products of all these separate units to be marketed through one sales organisation. It has been estimated that new trade in electrical accessories to a value of £150,000 might be secured in this market by British manufacturers through an organised campaign in the common interest, increasing their share of the total trade to approximately 20 per cent.

An encouraging example is afforded by the success achieved by United Kingdom manufacturers in the market for electric motors in which, in the teeth of the keenest of competition from Germany and Italy, they have rapidly advanced until they now hold 40 per cent. of the trade.

Standardisation Proposals

Opinion is gaining ground in favour of the adoption of new standard specifications by which inquiries for electrical materials could be regulated, the specifications now in use being unco-ordinated and in many cases out of date. The urgent motives existing to-day for facilitating the entry of United Kingdom goods into Argentina should provide a favourable opportunity for the introduction of British standards. General conditions of sale drawn up by the Institution of Electrical Engineers have been sympathetically studied at various times by traders' chambers in Buenos Aires without any definite result until recently when a modified set of conditions was agreed upon by most of the leading importers.

As with all other goods, a revival in business depends on an improvement in the general situation. At present stocks are very low, and once the corner is turned and exchange difficulties are removed demand should quickly spring up again.

Owing to the serious economic situation the trade in heavy electrical plant has been abnormally restricted and British trade has suffered particularly through the adoption of this policy by the British-owned railways. The most important recent arrival was a 50,000-kW turbo-generator supplied by the International General Electric Co. (U.S.A.). In connection with this contract transformers were supplied by the Metropolitan-Vickers Co. United Kingdom manufacturers have obtained a fair share of transformer orders. Sales of electric motors have been relatively few and competition has become keener in consequence. It is thought that any real improvement in the general condition of the market would quickly lead to inquiries for new plant, as in several districts extensions are urgently needed.

As in the case of heavy plant, the importation of electric cables has practically ceased for the time being. In such

trade as has been done the demand for cheapness has favoured Continental manufacturers, who continue to take orders with little or no profit. Some sporadic business has been done by German agents in goods which have been imported in bulk to order at very low prices, but the greater part of the market's needs continues to be supplied by the locally manufactured braided aerial and v.i.r. wires and cables. The oilfilled cable ordered by the Cia. Hispano-Americana de Electricidad for the connection between Buenos Aires and La Plata has recently been placed in service. It has a working pressure of 66,000 V and is probably the most important work carried out during the year. This cable was supplied by an Italian firm. The excellence of British cables is recognised, but their prices have not been low enough to compete successfully under the prevailing conditions.

Meanwhile the protection enjoyed by the local industry has been automatically increased by the drop in the prices of rubber and copper, which are now far below the customs valuation. As a result the import duties work out at a very high proportion of the true c.i.f. value, amounting in some cases to as much as 250 per cent.

Domestic Appliances

The principal domestic appliances in demand are radiators, cookers, hot water heaters, vacuum cleaners, refrigerators, fans, radio apparatus, lamps, dry cells, accumulators, electric light accessories and fittings, meters and small motors. A fair business has been done during the year in imported cookers, the sale having been greatly assisted by the propaganda of the Italo-Argentine Electric Light Co., which is anxious to develop the domestic load. Business would have been still better but for the fact that work on the construction of a number of projected new buildings has been suspended. As building is resumed the demand may be expected to expand proportionately, for it appears from the reports which are available covering the experience of the last two years that the electric cooker has definitely established itself in public favour. United Kingdom manufacturers have not been entirely unsuccessful in securing a share of the orders, but hitherto the trade has been chiefly with Germany and the United States. Meanwhile experiments are being made by local firms with a view to reproducing some of the most popular imported models. House heaters are all imported, but certain parts of water heaters are made locally, and in this line active competition is met with from the home industry.

There is a large trade in imported accumulators and dry cells. Accumulators are chiefly required for cars, for private electric light plants in the camp, and for radio apparatus where there is no supply of electricity. Motor car accumulators should be interchangeable with the American models, as most of the cars in the country are of American make. Dry cells are used extensively for radio, flash lights and household purposes. The principal suppliers are the United States manufacturers, who do between 70 and 80 per cent. of the whole trade. Lamps have maintained their sale better than most other articles, but here again the United Kingdom share is unduly small.

Owing to climatic conditions, hardly a family in Argentina is without an ice-chest of some sort. The largest demand is for the ordinary cheap wooden ice-chest, but in recent years a trade has sprung up in imported automatic refrigerators. The demand for electric refrigerators exceeds that for all other types, and a considerable expansion is anticipated when conditions improve. The chief suppliers of electric refrigerators are the United States and Sweden; the United Kingdom product is said to be too expensive. They are now being made locally in considerable numbers with imported parts. Mr. Irving says that there would be a good sale for a small domestic electric refrigerator which could be retailed at between £8 and £10.

The sale of radio receivers has been most active during the past year. All-electric "midget" sets, in particular, have attained great popularity, and importers have found it difficult to keep up with the demand. Selectivity is the first consideration, for in and near Buenos Aires there are no fewer than twenty broadcasting stations.

About 75 per cent. of the radio equipment sold in Argentina is of United States origin, Holland and Germany supplying the greater part of the remainder. Hitherto the United Kingdom has not offered the market the type of set which it requires, and has consequently missed much valuable business. Local manufacture has commenced, and increasing competition may be expected from this direction. A British radio valve manufacturer has obtained considerable success in a market which was formerly almost monopolised by Americans.

Broadcasting equipment has hitherto been supplied chiefly by American-controlled companies, and a German organisation, but a 20-kW Marconi equipment was recently ordered by a local British firm; this, it is expected, will increase the demand for short-wave receiving sets.

The Transport Situation

Reference is made in the report to the decrease of traffic experienced by the Anglo-Argentine Tramways Co., and to the efforts made to settle the traffic problems of Buenos Aires.

The construction programme of the Buenos Aires Central Terminal Railway (Lacroze Subway), which was begun late in 1928, was completed with the opening of the third and final section from Carlos Pellegrini to the terminal at Corrientes and L.N. Alem on December 1st, 1931, the first section, from Chacarita to Corrientes and Callao, having been placed in operation in October, 1930, and the second section, from Corrientes and Callao to Carlos Pellegrini station, where Corrientes crosses Diagonal Norte, in June, 1931. The tariff is being maintained at 10 cents for the whole trip, although this fare was established provisionally for a period of six months. Meanwhile there has been a moderate but steady increase in traffic. According to the terms of the concession this line is to be eventually extended into the zone of the Port.

The Compañia Hispano Argentina de Obras Públicas y Finanzas (CHADOPYF), which secured a concession in December, 1930, to construct four subway lines in the city of Buenos Aires, duly complied with the condition that the work should be commenced not later than September 18th, 1932, but owing to difficulties in making the necessary financial arrangements no progress has yet been made with actual construction.

The American Electrical Code

Getting to grips with the recovery measures

OUR American electrical contemporaries continue to provide very entertaining reading regarding the difficulties that are being met by the electrical industry in converting the President's trade recovery ideals into practical action. The *Electrical World* finds it difficult indeed to reconcile the Administration's efforts to hold down prices and yet to increase expenses. After referring to the bad times that manufacturers have had for the past three years, it asks whether it is surprising if they show hesitation in embarking upon a programme for increased pay rolls. "There is no money for benevolence." In dealing with capital goods industries, the National Industrial Recovery Administration must consider facts and not theory. Though a slight upturn is noticeable it is not sufficient to justify increased costs. Increased price goes with increased cost under present conditions, and this will benefit labour and increase employment—the objectives of N.I.R.A.

At the three sessions held by the electrical manufacturers to consider the Code of the National Electrical Manufacturers' Association referred to in the ELECTRICAL REVIEW last week (pages 145 and 161), it was stated that this represented more than 75 per cent. of the industry—300 companies and sixty sections determined by product classifications. The Vacuum Cleaner Manufacturers' Association, the Radio-Manufacturers' Association, the Washing Machine Manufacturers' Association, and the Battery Manufacturers' Association all argued for the development of individual codes for their respective associations, and protested against inclusion in the N.E.M.A. code. It was agreed that these associations should consult with N.E.M.A. respecting variations, while working as a single industry administration. The independent group of lamp manufacturers desired a separate code owing to the peculiar conditions encountered in the lamp industry. Manufacturers of telephone equipment and electrical wiring device makers did likewise.

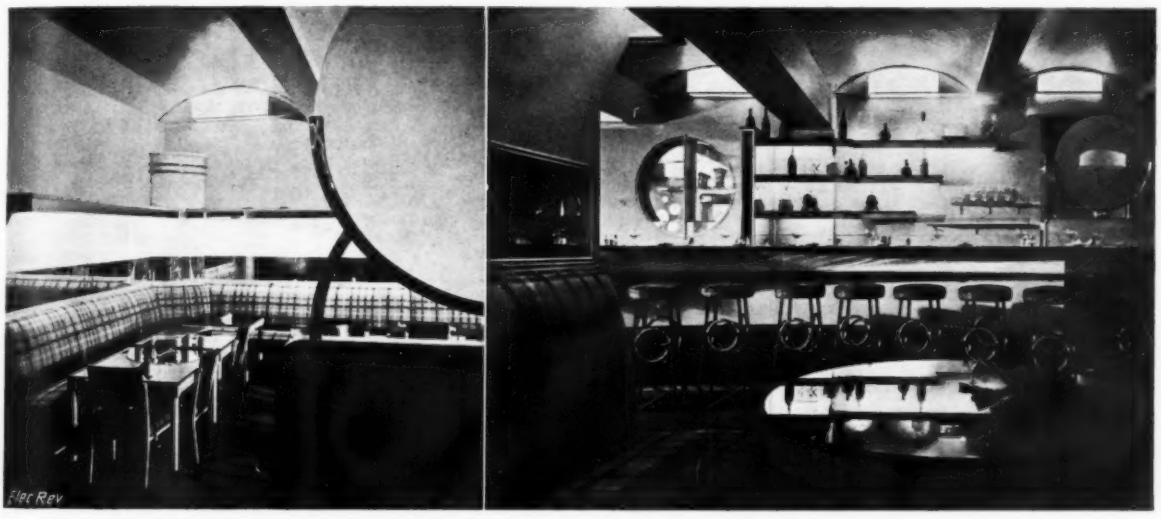
Labour made strong representations against the minimum wage, also to the exceptions to the minimum, and the thirty-six-hour week. Representatives of the International Brotherhood of Electrical Workers wanted a minimum of 90 cents per hour for skilled workers, a thirty-hour week, and an investigation of piecework and incentive schemes in the industry. An insulated wire company said that the Act would cause 55 per cent. unemployment instead of present full employment in its plant because of full capacity business and the absence of any excess skilled workers, while another company said that the code discriminated in favour of a large company. The proceedings then stood adjourned until the next day, July 20th.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Business Forecast

The "Business Forecast" for the third quarter of 1933 published by the Federation of British Industries, says that the bursting of the recent "bubble" of speculation on Wall Street has come as a timely reminder that new economic systems cannot be built in a day. On two previous occasions during the past two years it has been observed that Great Britain, so far as her domestic trade was concerned, had touched the bottom of the depression. On each of these occasions, however, financial breakdowns occurred *outside* her territory, which postponed sustained recovery. The present upturn in business is even more marked than the two previous ones, and since it is not confined to this country should continue to make headway despite the many unfavourable influences still operating. It is likely, however, to be confined mainly to the home section of our trade for the present, since the new wave of currency instability started by Professor Roosevelt's policy cannot fail adversely to affect our export trade. Indeed, should there be any further substantial depreciation of the dollar, special steps may require to be taken to control the inflow of foreign manufactures if the improvement of our home trade is not to be interfered with also.



Glass and mirrors are used to advantage in the lighting of the new Buttery at the Berkeley Hotel, W.

Besides, advantage of the present period of currency instability is being taken by many of our competitors to manipulate their currencies to our disadvantage.

Polish Railway Electrification Contract

The official contract for the electrification of the main Warsaw railway junction was signed on August 2nd by all the parties concerned. The signatories included those on behalf of the Polish State Railways, Colonel Adam Koc, Under-Secretary of State to the Ministry of Finance, Poland, Mr. G. H. Nelson, chairman and managing director, and Sir Holberry Mensforth, director, of the English Electric Co., Ltd., and Messrs. George Bailey and C. S. Richards, directors of the Metropolitan-Vickers Electrical Export Co., Ltd. The award of this contract to Great Britain follows earlier contracts placed with the English Electric Co. for 33,000 kW of generating plant and attendant switchgear for three power stations, for the installation of the Warsaw Suburban Tramways and for the electrification of the existing tramways in the Dombrowa Basin. The contract provides for six sub-stations, each to be complete with e.h.p. switchgear, transformers and rectifiers, with the necessary auxiliaries and d.c. feeder equipment. Fourteen rectifiers with a total capacity of 29,500 kW will be required. The six locomotives will be of the B+B type, weighing 72 tons and equipped with four motors at 550 h.p. The coach equipments, of which there will be eighty, will be for multiple unit operation with driving compartment at each end; they will be complete with heating apparatus, cable, conduit, &c., and each coach will have four 200-h.p. motors. The other material includes 250 equipments for trailer coaches, 200 km. of single track overhead line equipment and 16 km. of siding equipment, and six track sectioning cabins equipped with high-speed circuit breakers and necessary apparatus.

Standard Files and Rasps

The File Manufacturers' Association's agreed list of simplification is the basis on which the British Standards Institution has issued British Standard Specification No. 498—1933: Engineers' Files and Rasps. Whereas originally there were some thousands of different sizes and types, the Standard Specification provides for only 234 standard files of twenty-four different types. The specification is in two parts. The first part is devoted to nomenclature, and a description together with an illustration is given for each different type of file.

The second part includes twenty-nine tables giving the overall dimensions and the number of cuts for the various types. A very thorough investigation is at present being carried out at Sheffield University under Prosessor Lea, and considerable progress in arriving at a satisfactory method of test has already been made.

Copies of this Specification (No. 498—1933) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Novel Lighting at the Berkeley

The use of an unusual type of box lighting fitting renders the illumination of the new "Buttery" of the Berkeley Hotel, London, of particular interest. These fittings, made by Messrs. F. H. Pride, out of glass and mirrors, have been placed where the walls join the vaulted ceiling and add much to the general impression of compactness and neatness. Another feature of the illumination scheme is the pleasing effect obtained by installing 20-watt "Ediswan" tubular lamps, shielded from view by a shade, above a long mirror running round the walls. A "Keepalite" emergency lighting system is available in case of failure of the electricity supply. For the bar, which, incidentally, amply repays the care and attention paid to its lighting, four special "Frigidaire" refrigerators have been placed under the counter, the compressor units being installed in the basement. To keep the air pure, and at a comfortable temperature, the Air Conditioning Cpn. (Jeffreys), Ltd., have supplied air conditioning plant with a cooler made by Messrs. H. J. West Refrigerating Co. and fans manufactured by Messrs. Matthews & Yates, Drayton thermostats being also incorporated. The architects were Messrs. Stanley Hall & Easton & Robertson, the electrical work being carried out by the Savoy Hotel engineering staff under the supervision of Mr. F. C. Poy.

Dutch Lamp Import Regulations

The Dutch Government has introduced a Bill for the further regulation of the imports of glow lamps. The Government finds that large offers of foreign glow lamps emanate from countries outside Europe and that the prices at which the lamps are offered are such that even if Dutch lamp makers were to leave out of account wages and provision for depreciation, competition with the imported lamps would be an unequal contest.

Catalogues Required

The Lindley Thompson Transformer & Service Co., Ltd., St. Mary's Road, Slough, Bucks, ask for catalogues, prices and samples of materials for the building of transformers.

Glow Lamp Production in Turkey

A contradiction has been issued from Stockholm of a report from Haifa to the effect that a Swedish group intends to establish a glow lamp factory in Palestine, whose lamp requirements have hitherto been supplied by members of the International Glow Lamp Cartel and more recently by cheaper Japanese lamps. The truth about the matter, according to

the Swedish report, is that a glow lamp factory is to be erected at Istanbul, which is to be equipped with Swedish machines and plant.

Electrical Company's Rating Appeal

The hearing of the appeal by the St. James & Pall Mall Electric Light Co., Ltd., to the House of Lords from the judgment of the Court of Appeal allowing the appeal of the City of Westminster Assessment Committee from the judgment of a Divisional Court of King's Bench has been fixed for October 23rd next.

An Elma Publication

We have received from the Electric Lamp Manufacturers' Association (Lighting Service Bureau), a copy of a new publication entitled "The Lighting Service Bureau—And What it Stands For." This has an attractive cover in gold and black and contains some excellent illustrations of the various displays in the Bureau's premises at 2, Savoy Hill, W.C.2.

Swiss Electrical Exports

The exports of electrical machinery and apparatus from Switzerland during the first half of the current year attained a value of £684,710, as compared with £549,710 in the corresponding period of 1932.

E.D.A. (North-Midland Area) at Hull

The Lord Mayor of Hull (Alderman J. M. Dossor, J.P.) and the Sheriff (Alderman B. Pearlman, J.P.) received the North Midland Area Committee of E.D.A. at the new electricity showrooms in Ferensway on August 2nd. Luncheon, cooked on the premises, was served in the lecture hall to forty-six guests. Mr. Thomas Roles, chairman of the Committee, congratulated Hull upon its developments in recent years, not the least of which was the splendid building in which they were assembled, and which was worthy of their fine undertaking. He predicted rapid developments in the electrical industry consequent upon the reorganisation of E.D.A., and called for united support from all supply authorities. The Lord Mayor responded on behalf of the City, and Alderman Pearlman responded on behalf of the Electricity Department.

Mr. J. N. Waite, the city electrical engineer, proposed the toast of the British Electrical Development Association, and looked forward to great activity under the new régime. Hull would, as in the past, do its full share in the coming campaigns. Mr. V. W. Dale, business manager of E.D.A., in responding, expressed the hope that in the coming activities E.D.A. would have the help of manufacturers, wholesalers, and contractors, and that probably a National Co-operative Committee would be formed through which all sections of the industry could express themselves. Following the luncheon, the party was conducted over the showrooms and the administrative offices.

A Swedish Jubilee

The Swedish General Electric Co. (Asea), has recently celebrated its jubilee. Due to the foresight and initiative of Mr. Fredholm, a company with the title "Elektriska Aktiebolaget i Stockholm" was founded in Sweden in 1883, with the object of introducing electric lighting by direct current and manufacturing the necessary plant and equipment. Mr. Jonas Wenstrom became associated with the new firm and in 1891 the company was reorganised and its share capital increased from £5,000 to about £30,000. Alteration in name to the Allmanna Svenska Elektriska Aktiebolaget was decided upon, while the head office and workshops were transferred to Westeras. Rapid progress resulted and in 1903 Mr. J. Sigfrid Edstrom assumed the position of managing director. The following ten years represented a period of great activity for the electrical industry in general. In Sweden, in particular, the development of the available water power created a demand for generating machinery and Asea's future was largely assured by the important orders placed by the State in connection with these hydro-electric undertakings. Another favourable circumstance was the decision of the State Railway authorities to experiment with electrification. The war period brought increased business to the company. The scarcity of petrol gave great impetus to the electrification of rural districts and the electric energy consumption figure rose enormously. Several industrial concerns were founded, among them being the Nya Forenade Elektriska A.B. at Ludvika, and the Surahammar Iron Mills, which now supply the iron and steel requirements of the company. The paid-up share capital was gradually increased to £4,200,000. The number of employés in 1932, including subsidiary companies, was nearly 10,000, and the power represented by machines and transformers manufactured in the same year amounted to about 1.5 million h.p.

Converting plant under test at the B.T.H. works, Rugby, including a rectifier tested to over 10,000 A; a rectifier for 20,000 V d.c.; a rectifier with grid control (type tested to 12,500 kW); and a motor-convertor rated at 1,500 kW, 750 r.p.m.

L.E.P. Prize Vehicle

In the Eccleston Rose Queen and Band Carnival on July 29th, the vehicle entered by the Lancashire Electric Power Company obtained second prize in the class for "the best trades' turnout." One side of the van displayed an electric washboiler, washing machine, &c., with the slogan "Electricity takes the drudgery out of washday." An electric cooker also featured in the display. The other side of the vehicle consisted of an attractive arrangement of electric storage tanks and converted hot-water cylinders. The heavy border at the top of the coxcomb above the van was in a vivid red and the lettering below "Electricity for Service" in a shade of blue which harmonised with the showcards.

The Newfoundland Electrical Market

In his report on the economic conditions in Newfoundland (Stationery Office, 2s. 2d. post free), Mr. H. F. Gurney, H.M. Trade Commissioner in Newfoundland and the Maritime Provinces of Canada, states that the United Kingdom has not made much progress during the last two years (since the previous report was issued) in its trade with Newfoundland, despite the fact that since September, 1931, it has been off the gold standard and Newfoundland importers have been able to purchase United Kingdom goods at a discount varying from 15 per cent. to 25 per cent. in terms of their own money, while they have had to pay a premium of approximately 15 per cent. when importing goods from the United States. The imports under the heading of "Electrical goods and apparatus" showed a large decline in comparison with previous years. The total value was $193,744 (U.S.A. $156,630, Canada $29,265, and United Kingdom $5,941). Apart from telephone and telegraph instruments and wire, very little apparatus of an industrial character was imported, the chief items being principally for domestic use, such as electric lamps, irons, heaters, toasters, radio apparatus, refrigerators, and lighting fittings. U.S.A. standards are adopted in Newfoundland and United Kingdom manufacturers will not be able to supply the market unless they manufacture to these standards.

Business Administration

The Department of Business Administration which was started at the London School of Economics, with Mr. Jules Menken as its head, has signalised the completion of its second year's operations by announcing a new development—a university scheme designed to link business and the universities more closely than hitherto by providing posts and opportunities for university graduates trained in the department. A number of well-known companies and firms of national standing are participating in the scheme. Candidates acceptable for the year's specialised business course are university graduates who have just taken their degree and possess high personal qualifications. They are assured of definite posts at salaries arranged in advance, when their training is completed. During the past two years forty students have been trained by the department; most of them were university graduates between twenty-two and twenty-eight years of age. Nearly one-half were seconded for training by firms allied to the department. The courses cover such subjects as production, finance, statistics, accounting and personal management, marketing, retail and sales management, and a variety of actual business problems. Those who are interested in the matter, whether as employers or as commercial aspirants, should write to Mr. Menken at the Department, 11, Clement's Inn Passage, W.C.2, for particulars.

Social Events

At a garden party held at the South Wales Electric Power Company's depôt, Cwmbran, over a hundred employés and their wives and friends were the guests of the Eastern Section, S.W.P. Sports and Social Club.

The occasion was the Section's official opening, and at little cost, but a great deal of voluntary labour, the local members of the club had changed a very rough piece of land into tennis court, cricket pitch, putting green, quoit pitches, and had made a start on a miniature golf course. An old

hut had been renovated and fitted up with table tennis, card-room, and rifle range. Mr. C. T. Allan, manager of the company, and vice-president of the S.W.P. Sports and Social Club, in declaring the section open, stated that this was the first of a series of Sectional Clubs, which, he understood, were being formed by employés of the company in various areas. Contingents from Central Division Mains, Treforest, Upper Boat power station, and Cardiff entered into various friendly competitions, the tug-of-war contest being won by the Central Mains team.

Worthing's Street Lighting

A new standard of illumination has been introduced in this South Coast resort which is more in keeping with its good-class roads. Tests have shown that good results have been achieved, while the accompanying photograph speaks for itself. In the less important thoroughfares specially designed equipment, consisting of the "Worthing" lantern, incorporates the well-known "Revo" directional refractors, the function of which is to collect the light rays normally wasted in an upward direction and, by means of its prism formation, redirect this light to supplement that of the bare lamp projected towards the mid-span region, with an increase in utilisation efficiency of over 100 per cent. These units are mounted 16 ft. 6 in. above the road, in staggered positions, at approximately 150-ft. intervals, *i.e.*, 9 to 1 spacing height ratio, with 200-watt lamps. The midspan region is illuminated to a minimum intensity of 0.05 foot-candle, with a consumption of 0.022 watt per sq. ft. of road area. The location of the units has been judiciously planned, which, with the high mounting, results in freedom from glare, uniformity of illumination, and good visibility. In the more important thoroughfares similar equipment has been installed with 300-watt lamps.

Revo street-lighting equipment at Worthing

The material is the special production of the Revo Electric Co., to the instructions of the borough surveyor and engineer, Mr. P. E. Harvey, who has carried through this improvement.

The Levant Fair

H.E. the High Commissioner, patron of the Levant Fair, is to lay the foundation stone this month of the exhibition buildings for next year's Fair which will be held from April 26th to May 26th at Tel Aviv. The arrangements include a large section for British industries and a special pavilion for the Dominions.

Malayan Electrical Imports

Imports of electrical goods and apparatus into Malaya during 1932 were valued at £269,820, as compared with £493,429 during the preceding year.

Recent Contracts

The Brush Electrical Engineering Co., Ltd., has received two orders for double-deck trolley-bus bodies—forty-six for Nottingham Corporation and twenty for Derby Corporation.

The new Victoria News Theatre, Victoria Station, has been equipped with a Chloride storage battery of forty-eight cells for emergency lighting. The Royalty Theatre, Dean Street, W.1, is similarly equipped, both installations being carried out by the Berkeley Electrical Engineering Co., Ltd.

Prices of Materials

Messrs. F. Smith & Co. report, August 9th: Electrolytic copper bars, £42, 10s. dec.; electrolytic copper wire rods, £47 10s., 10s. dec.; electrolytic copper h.c. wire, 7⅛d., ⅛d. dec.; electrolytic copper sheets and silicium bronze wire, no change.

Messrs. Edward Till & Co. report, August 9th: India-rubber, Para fine, 5½d. ½d. dec.

Messrs. James & Shakespeare report, August 9th: Copper bars (best selected), sheet and rod, no change; English pig lead, £13 10s., £1 5s. dec.

Trade Announcements

Messrs. Dorman & Smith, Ltd., announce that they have removed their London office to 41, Berners Street, W.1, where they will be represented by Mr. W. A. Lane, director and London manager of Messrs. Berkeley & Young, Ltd., and staff. Their telegraphic address, Prefix London, is being continued as Prefix Phone London, and their new telephone number is Museum 6034/5. They believe that the new arrangement will be found to be convenient and advantageous by their many London friends. It will, at present, save time in most cases to send correspondence to the head office, Ordsal Electrical Works, Salford, Manchester.

Mr. W. A. Ackers has joined the sales department of the Northern Steel & Hardware Co., Ltd., and represents the company in the North Wales and Anglesey territory.

Messrs. Hick, Hargreaves & Co., Ltd., have acquired the goodwill, patterns and drawings of Messrs. Galloways, Ltd., Knott Mill Ironworks, Manchester. These also include the goodwill, patterns and drawings of Messrs. John Musgrave and Sons, Ltd., and J. & E. Wood.

The Curtis Manufacturing Co., Ltd., has removed to 26-28, Paddenswick Road, Hammersmith, W. (telephone: Riverside 4456).

Derby Cables, Ltd., has removed its London office to Bush House (East Wing), Aldwych, W.C.2 (telephone: Temple Bar 7691).

New Catalogues and Lists

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlet No. R21/2 dealing with d.c. motor starters.

Century Electric Co., Saint Louis, Mo., U.S.A.—Publications relating to "Century" motors and fans.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Leaflets illustrating and describing the company's 1934 radio receivers.

Siemens Brothers & Co., Ltd., Woolwich.—The August number of the "Siemens Magazine" containing an article on "Electric Cables for Heating Forcing and Seed Beds."

Mullard Wireless Service Co., Ltd., 111, Charing Cross Road, W.C.2.—A folder entitled "Mullard Data for Your 1933/4 Catalogue."

Samuel Fox & Co., Ltd., Stockbridge Works, near Sheffield.—A brochure on the case-hardening of special steels by nitrogen.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.—Print No. 450/46, dealing with a gauge type pressure switch with relay.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—An illustrated folder drawing attention to the company's white tough rubber sheathed cable. Also a reprint of an article from "Distribution of Electricity" entitled "Calculating the current rating of paper cables."

Birkby's, Ltd., Liversidge, Yorks.—Leaflet D, issue 2, containing particulars of "Elo" synthetic resin products.

United Steel Companies, Ltd., 17, Westbourne Road, Sheffield.—An illustrated booklet describing the "Phœnix" (standardised) rapid machining steel.

Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1.—A leaflet drawing attention to the company's control unit for irons, water heaters, tubular heaters, portable tools and fans.

Bankruptcy Proceedings

C. W. Everson, trading as Eversons Electrical and Radio Depôt, radio dealer, 93, High Street, Brownhills, near Walsall, Staffs.—This debtor appeared at the Court House, Lichfield Street, Walsall, recently, for his public examination. His statement of affairs disclosed gross liabilities of £993, of which £989 was expected to rank for dividend, whilst there was an estimated deficiency of £620. Debtor stated that he commenced business at 195, High Street, Brownhills, in October, 1923, with a small capital. He dealt in radio and wireless accessories, and in 1928 transferred the business to 93, High Street. For about five years the business yielded sufficient profit to enable debtor to make a living, but after that period the sales declined, and he became in arrears with his accounts. He had borrowed money for use in the business. He added that recently the prices of electrical and wireless goods had slumped considerably. He incurred losses in the part exchange of radio sets, being unable to dispose of the old sets. He also sustained losses on hire-purchase accounts. The examination was adjourned for closing.

J. Liptrott, wireless dealer (trading as the Universal Radio and Electrical Co.), 101, High Road, Beeston, Notts.—The first meeting of the creditors was held recently at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham. It was stated that in June last year debtor took over a branch business conducted by his employers, for a consideration of £145, which money was provided by a friend of the debtor, whose own capital amounted to £20. The business was moderately successful, but in January this year proceedings were instituted against debtor for repayment of the purchase money. The action was decided against debtor, who attributed his failure to the adverse judgment. The matter was left in the hands of the Official Receiver.

J. E. Lander, electrical and radio engineer, 25, Union Street, Newton Abbot, and 12, School Road, Newton Abbot.—The public examination of this debtor took place at the Castle, Exeter, on August 2nd. It was disclosed that the liabilities expected to rank totalled £1,233, and the assets were put down

at £726, leaving a deficiency of £562. Debtor attributed his failure to liabilities being increased by creditors suing, competition, which necessitated cutting prices to obtain orders, and difficulty in collecting book debts. Debtor said that during the last twelve months law costs had amounted to £125. The examination was adjourned.

G. Clarke, electrician, 52, Cottage Beck Road, Scunthorpe, Lincs.—The receiving order in this matter was made on debtor's own petition, and at the first meeting of creditors held recently at the Official Receiver's Office, St. Mary's Chambers, Great Grimsby, a statement of affairs was submitted which showed liabilities of £367 with assets of £9. The case being a summary one was left in the hands of the Official Receiver, as trustee.

J. S. Lowden, wireless dealer, 175, Piccadilly, London.—The statement of affairs filed shows unsecured liabilities of £2,793 and assets of £36. The following are the principal creditors: A. J. Balcombe, Ltd., £184; Brownie Wireless Co., £250; Electrical Trading Association, £118; Pix Valve Co., £863; Peak Electrical Trading Co., £50; Smith's Printing Co., £463; Vactite Wire Co., £120.

E. Blackmore, electrician, 33, Monmouth Road, Dorchester.—Receiving order made July 26th on debtor's own petition.

First meeting August 11th at 12, Rolleston Street, Salisbury. Public examination October 10th at the County Hall, Dorchester.

H. C. Mealing (Yorkshire & Lincolnshire Electric Development Co.), electrical trader, 73, Lawrence Street, York.—First and final dividend of 2s. 7d. in the £, payable August 10th, at the Official Receiver's offices, the Red House, Duncombe Place, York.

W. R. Blakeway (Pearson & Co.), electrical engineer, 31, High Street, Southampton.—First and final dividend of 1d. in the £, payable August 18th at 44, Above Bar Street, Southampton.

A. G. L. Pennock, wireless and electrical dealer, 59, Primrose Hill Street, Coventry.—Application for discharge to be heard on October 16th at the County Hall, Coventry.

F. D. Simpson, electrical engineer, 101, Cleveland Street, Doncaster.—Receiving order made August 1st on debtor's own petition.

W. Sutcliffe, electrical engineer, 40a, Old Church Street, Oldham.—Trustee, Mr. R. K. Clark, Byrom Street, Manchester, released July 14th.

G. W. Mitchell, electrical engineer, 34, Locks Hill, Portslade, Sussex.—Discharge suspended for one year until July 13th, 1934.

C. B. Greenhough, radio engineer, 56, Old Street, Ashton-under-Lyne.—Receiving order made August 4th on debtor's own petition.

C. E. Moore (C. E. Moore & Co.), wireless engineer, 35, High Street, St. Neots.—Receiving order made August 4th on a creditor's petition.

Company Liquidations

Thames Valley Radio Service, Ltd.—Under this compulsory liquidation accounts have been lodged showing liabilities of £1,327 against assets of £176. The following are the principal creditors:—Johnson Talking Machine Co., £59; L. E. S. Distributors, Ltd., £336; Mrs. W. E. Love, £372.

Weiss, Biheller & Brooks, Ltd.—Particulars of claims by August 31st to the joint liquidators, Mr. G. W. Bacon, Norfolk House, Laurence Pountney Hill, E.C., or Mr. R. Wertheim, 5, Cleve Road, N.W., or Mr. H. Hildesley, 106, Rivermead Court, S.W.

F. A. Wireless Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Corlett Electrical Engineering Co., Ltd.—Particulars of claims by September 4th to the liquidator, Mr. J. Houghton, 5, King Street West, Wigan.

Walter Withers & Son, Ltd.—Winding up voluntarily. Liquidator, Mr. A. Hosking, 63, Weston Park, Crouch End, N.

Pantheon Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. P. S. Booth, 2, Bixteth Street, Liverpool.

Chester Electrical Co., Ltd.—Meeting, September 1st, at 26, Newgate Street, Chester, to receive an account of the winding-up by the liquidator, Mr. T. G. Williams.

Dissolutions of Partnership

E. W. Bartlett and Stokes, electrical engineers, 110, City Road, Cardiff.—Messrs. E. W. Bartlett and W. W. Stokes have dissolved partnership. Mr. Bartlett will attend to debts.

A.E.J. Electrical Services, electrical contractors, 111a, Lord Street, Wolverhampton.—Messrs. W. T. Chambers and A. E. Jones have dissolved partnership. Mr. Jones will attend to debts and carry on the business.

Electricity Supply

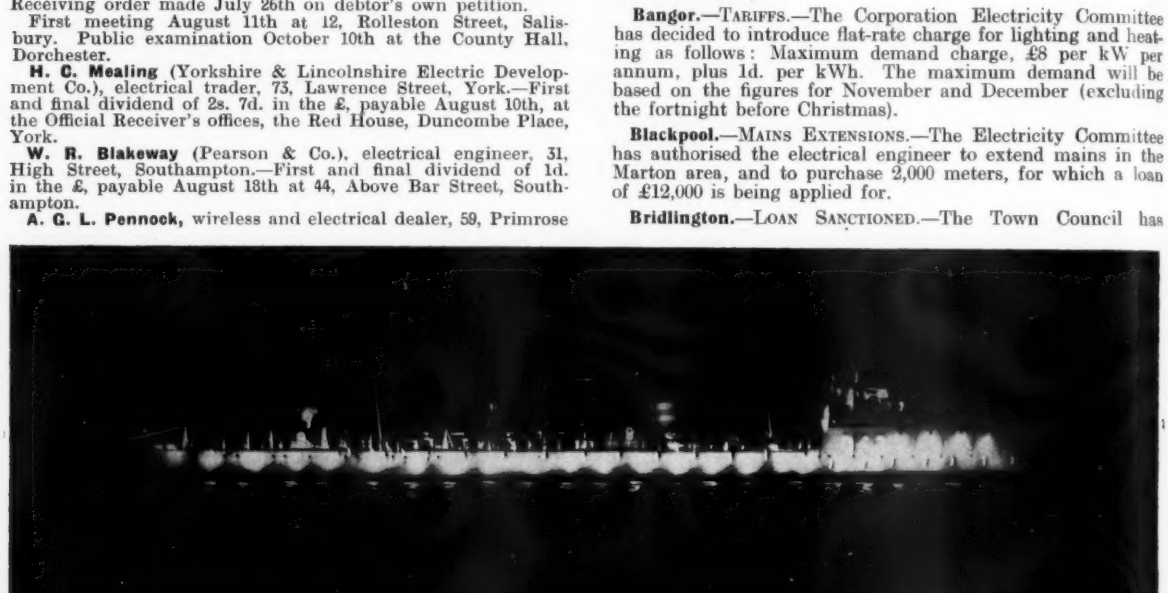
Lighting, Domestic, Power

Australia.—SYDNEY.—We have received the annual report of the Electricity Department which shows that a loss of £178,950 in 1931 has been turned into a profit of £43,347 for the year ended December 31st last. The total revenue amounted to £2,418,143, as compared with £2,319,579, while expenditure decreased from £1,058,700 to £1,034,062. The amount of electricity sold rose from 305,551,729 kWh to 327,612,216 kWh and the maximum demand from 118,200 kW to 125,700 kW. There were 199,389 consumers in 1931, and nearly 5,000 were added during the following year. The Sales Department reported a satisfactory year, 12,910 kW being added to the connected load through the efforts of that department. This should result in an estimated additional revenue of £63,131.

Bangor.—TARIFFS.—The Corporation Electricity Committee has decided to introduce flat-rate charge for lighting and heating as follows: Maximum demand charge, £8 per kW per annum, plus 1d. per kWh. The maximum demand will be based on the figures for November and December (excluding the fortnight before Christmas).

Blackpool.—MAINS EXTENSIONS.—The Electricity Committee has authorised the electrical engineer to extend mains in the Marton area, and to purchase 2,000 meters, for which a loan of £12,000 is being applied for.

Bridlington.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £10,305, being excess expenditure incurred in connection with the change-over.



The suspension of "Mazda" lamps in projectors about 8 ft. outboard from spars lashed to the deck gave the destroyer H.M.S. "Windsor" an unusual and spectacular appearance at Cowes last week.

Bolton—REDUCED CHARGES.—The Corporation Electricity Committee is to make a reduction in the charges for current supplied for the trams, which will mean a saving of from £6,000 to £7,000. Domestic supplies through prepayment meters are to be charged for at the rate of 5½d. per kWh.

Chanctonbury (Sussex).—SUPPLY DEVELOPMENTS.—The Electricity Supply Corporation, Ltd., has informed the Rural District Council that it intends to erect l.p. overhead distributing mains at Ashington, and that the question of providing an h.p. main at Storrington-Amberley is under consideration.

China.—TIENTSIN.—In spite of the difficult economic and political situation in China, an increased output of 16.7 per cent. is reported in the annual report for 1932 of the Electricity Department, Tientsin. This increase is greater than any during the last five years, the actual figures being 9,171,166 kWh, as compared with 10,701,404 kWh. The net profit was Tls. 162,760 (Tls. 140,740 in 1931), the total revenue being Tls. 659,597, and the working expenses Tls. 496,837.

Chester.—LOAN.—The City Council has applied for sanction to a loan of £2,400 for cables for streets in the city in which there are no supply cables.

Colchester.—DISTRIBUTION DEVELOPMENT.—The Electricity Committee has resolved, subject to the consent of the Minister of Transport, to provide l.p. distribution in the following districts: Weeley Hill, Layer Breton, Choat's Corner and Gallows Green, Halstead Road, Westwood Park, and Wix.

Dumfries.—SUPPLY TO LANGHOLM.—In connection with the County Council's scheme for the electrification of the county, a public supply of electricity has been made available for the first time in the borough of Langholm. This event coincided with the Langholm Common Riding celebrations, during which part of the new scheme of electric street lighting was available.

QUICK WORK!—The advantage of a public supply of electricity has been quickly demonstrated, for on July 31st a large woollen mill was partially destroyed by fire. The weaving shed portion, fortunately, was only slightly affected and, by quick work on the part of the Council's staff, a supply of electricity was made available from the public mains, and the mill was enabled to restart, running from the Council's supply, on August 7th.

Eastbourne.—LOANS.—The Electricity Committee is apply-

ing for sanction to borrow £25,000 for mains extensions, £717 for supply to Hankham, and £6,501 for supply to Wannock, &c.

Eiham.—SUPPLY TO HAWKINGE.—With reference to a supply of electricity at Hawkinge, the Folkestone Electricity Supply Co. has informed the Rural District Council that the Air Ministry objects to overhead cables because of the risk to aeroplanes, and stating that the cost of underground cables is prohibitive. The matter has been left in abeyance pending a meeting of the Town Planning Committee, it being considered that, if houses to be built are not spread about, there will be a better chance of securing underground cables.

Finchley.—SUPPLY EXTENSION.—The North Metropolitan Electric Power Supply Co., Ltd., has obtained an Order to provide a supply of electricity to the Halliwick Manor Estate.

Glasgow.—ESTIMATES.—The Electricity Committee has approved the estimate of revenue and expenditure of the Electricity Department for 1933-34 as follows: revenue £1,080,667; expenditure, £1,076,910; leaving a surplus of £3,757. An estimate of the capital expenditure for the year till May 31st, 1934, amounting to £105,000 in respect of distribution to be met out of loans, was also approved.

FILTRATION PLANT FOR BATHS.—The Baths Committee has approved a recommendation that filtration plant be installed in the North Woodside baths at an estimated cost of £2,500.

Hoddesdon.—ELECTRIC PUMPING PLANT.—The Urban District Council has decided to install electrical pumping machinery in place of the steam plant at the sewage disposal works.

Hull.—HIRING OF COOKERS.—The Corporation electrical engineer has reported that in view of the improved methods and production, and consequent fall in prices of vitreous enamelled cookers, it is desirable to change over to this type of cooker for the standard hiring model.

Japan.—NEW POWER PROJECTS.—The Yahagi Power Co. has commenced work on a new 66,000-kW power at Taifu, and the Kwansai Kyodo Steam Power Co. is increasing the capacity of its plant from 50,000 kW to 150,000 kW. The Tokio Electric Light Co. is to construct fourteen power stations on the Tadami River in Fukushima-ken, at a cost of approximately 88,000,000 yen.

Leeds.—LOANS.—The Electricity Committee is seeking permission to borrow £44,000 for land, buildings and equipment for a sub-station at Whingate, and has obtained sanction to borrow £30,000 for wiring installations.

Liverpool.—SUCCESS OF ASSISTED WIRING SCHEME.—The assisted wiring scheme has proved an extremely satisfactory propaganda medium and the results obtained have exceeded expectations, 5,842 new consumers having been obtained this year, says Mr. P. J. Robinson, the city electrical engineer in his annual report. The amount of electricity sold per head of population in the Liverpool area is 307 kWh, which compares favourably with the average consumption for authorised undertakings. The maximum load was 113,580 kW, as against 114,210 kW. The average price received per kWh for all purposes was 1.12d. 1.685 lb. of coal were used per kWh sold, as compared with 2.035 lb. for the previous year. An extensive programme has been put into operation to speed up the change-over from d.c. to a.c. Four hundred additional men have been absorbed for work who were in receipt of relief.

Concerning the electricity showrooms, Mr. Robinson explains these were not established primarily for the sale of apparatus, but rather as a demonstration centre where members of the public could examine the various types of equipment and see them demonstrated in actual service. This policy had resulted in a greater financial return, because of the increased consumption of electricity, than would have been obtained were the showrooms treated as a retail profit-earning shop.

London.—ST. MARYLEBONE.—The Electricity Committee recently agreed that in the event of the adoption of electricity for water heating at the new Shouldham Street Baths, the charge for electrical energy would be 0.175d. per kWh. The matter has been reconsidered and terms have been arranged with Mr. Brunt, the consultant engaged by the Baths Committee, for an inclusive charge for all electricity supplies of a sum not to exceed £3,000 a year, subject to review annually.

The Electricity Committee is to obtain permission to borrow £10,000 for transformer stations on consumer's premises.

Luton.—£14,000 APPROPRIATION.—The Town Council has decided, subject to the consent of the Commissioners, to appropriate £14,000 from the profits of the electricity works for house meters and services.

Malvern.—LOAN.—The Urban District Council has applied for sanction to a loan of £5,000 for mains and services.

OVERHEAD LINES.—The Council has approved an application by the Shropshire, Worcestershire, & Staffs Electric Power Co. for permission to erect overhead line conductors across the sewage works at Sherrards Green.

Minster-in-Thanet.—OVERHEAD LINES.—The Isle of Thanet Rural District Council is offering no objection to the use of overhead mains by the South-East Kent Electric Power Co., Ltd., in connection with the supply of electricity from Sandwich. In four thoroughfares in Minster underground cables will be used.

Oswestry.—LOAN.—The Town Council has decided to apply for sanction to borrow £11,000 for extensions to the undertaking.

Reading.—PURCHASE OF UNDERTAKING.—Negotiations for the acquisition of the undertaking of the Reading Electric Supply Co., Ltd., by the Corporation have now been completed, the purchase price being £443,000.

Reigate.—HIRING-OUT TERMS.—The Town Council has decided to hire out aluminium ware for use with electric cookers as follows: 3½-, 5-, or 7-pint stewpan, 4s. per quarter; with one steamer, 1s. extra, or with one casserole, 6s. per quarter.

Rhodesia.—ELECTRICITY FOR LUSAKA.—It has been decided to install an electric lighting scheme at Lusaka, the new capital of Northern Rhodesia. A temporary plant may be installed pending the erection of permanent machinery.

Runcorn.—SUPPLY TO ANTROBUS.—The Mersey Power Co., Ltd., has informed the Rural District Council that it is unwilling to waive its rights of supply in the event of the Mid-Cheshire Electricity Supply Co., Ltd., agreeing to supply the parish of Antrobus. The company points out that its programme is being developed in accordance with the pre-arranged plan, and it desires to complete the system before embarking on further outlying extensions.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated cost of £8,107.

Shipston-on-Stour.—OVERHEAD LINES.—The Rural District Council has decided to raise no objection to l.p. overhead distribution mains being erected at Newbold-on-Stour by the Shropshire, Worcestershire & Staffordshire Electric Power Co., and also to an 11,000-V tapping for the supply.

South Africa.—VICTORIA FALLS POWER.—An agreement which concedes Northern Rhodesia's hydro-electric power rights at the Victoria Falls to the Victoria Falls & Transvaal Power Co., Ltd., has reached London for signature, if approved, by the Secretary of State for the Colonies and the board of the company. It gives the company the sole right to take hydro-power from the Falls for sixty years, which may be extended, the company to pay £500 a year plus 1s. per h.p. The company is to install a generating station to meet any reasonable demand as early as possible. If at the end of five years the company has not begun operations and the Government is satisfied that a demand for electricity and other conditions justify the expenditure, the Government may call upon the company to erect the generating station. Provision is made for arbitration should the company dispute the adequacy of the demand. In order to prevent the beauty of the Falls from being impaired, an area within a radius of five miles has been reserved on which no industrial works will be allowed. The scheme provides for a generating station at the Silent Pool, which is some distance from the lip of the Fall and does not intrude on any of the popular viewpoints.

ELECTRICAL DEVELOPMENT AT PORT ELIZABETH.—The Port Elizabeth ratepayers have sanctioned the raising of a loan of £173,526, of which £110,000 will be spent on the supply of circulating water from the sea to the municipal generating plant. The plant requires 13,700 gallons of circulating water a minute, and loss from evaporation is 1½ million gallons a day. Fresh water would cost £54,000 a year, so it has been decided to pump water from the sea.

South Shields.—ASSISTED WIRING.—The Town Council has received sanction to borrow £3,000 in respect of wiring installations with prepayment meters in connection with its assisted wiring scheme.

Switzerland.—NEW HYDRO-ELECTRIC POWER STATION.—Steady progress is being made with the construction of a large hydro-electric power station at Klingnau. It is intended to utilise the waters of the last 4½ miles of the River Aare, and the plant will comprise three sets of 35,000-kW Escher-Wyss turbines and Brown-Boveri generators. It is anticipated that it will be able to supply about 230 million kWh per annum.

Torquay.—ASSISTED WIRING.—The Electricity Committee hopes to inaugurate a scheme for assisted wiring as soon as adequate office and showroom accommodation has been provided to cope with the work that will result.

SUPPLY TO TEIGNHEAD AREA.—The Electricity Committee has interviewed the Teignmouth Electric Light & Power Co., Ltd., with regard to the proposal that the Corporation should become the undertakers for the supply of electricity in the Stoke-in-Teignhead and Combe-in-Teignhead areas, but has decided not to proceed with negotiations at present.

REVISED STANDING CHARGES.—It has been agreed to make the following standing charges for all council houses: parlour type 10s. 6d., and non-parlour type 9s. 6d. per quarter.

Wallasey.—YEAR'S PROGRESS.—Mr. B. T. Hawkins, the borough electrical engineer, in his annual report, states that the sales of electrical appliances on hire-purchase terms continue to increase; the number of cookers has doubled, and water heaters recently introduced have met with a ready acceptance.

Weymouth.—LOANS SANCTIONED.—The Town Council has received sanction to a loan of £25,000 for mains and services, and £5,000 for sub-station equipment.

Wick.—INQUIRY.—The Town Council has decided to accept the report on the Electricity Department and to thank the Electricity Commissioners for their assistance and Mr. Nimmo for the fair way in which he conducted the recent public inquiry.

Workington.—HIRING OF HEAT STORAGE COOKERS.—The Electricity Committee has appointed a sub-committee to consider the question of the supply on hire of thermal storage cookers.

Worthing.—LOAN.—The Electricity Committee has obtained sanction to borrow £20,000 for mains and services, and £1,583 for cables, in Tarring and Salvington.

Traction

Australia.—TRAMWAYS IN THE COMMONWEALTH.—A report by the Commonwealth Statistician shows that at June 30th, 1932, the tramway mileage open for traffic decreased by 28 miles during the year, leaving 602 miles open. The capital cost of these was £25,485,180. Of the lines open, 554 were operated by electricity, 22 miles by steam, 25 miles by sub-surface cable traction, and one mile was horse-drawn; 380 miles were under Government and 186 miles under municipal control, the remaining 36 miles being privately owned. Electric tramways ran 74,040,000 car-miles, and 588,634,000 passengers were carried. The gross revenue for the year was £6,775,678, exceeding the working expenses, £5,254,588, by £1,521,090.

Derby.—LOAN SANCTIONED.—The Town Council has received sanction to a capital expenditure of £50,000, the greater portion of which will be used for the purchasing of twenty trolley-buses. The remainder will be apportioned as follows: £2,500 for the conversion of a tramway shed; £4,720 for street work in connection with trolley-bus extensions.

Dover.—TROLLEY-BUSES TO REPLACE TRAMS.—The Town Council has adopted a report by the Tramways Committee for the conversion of the existing electric tramways to a system of trolley vehicles at an estimated cost, including the promotion of a Bill in Parliament, of £81,734.

France.—ELECTRIFICATION CONTRACTS.—In connection with the electrification of the 160-mile Vierzon-Brive main line, the Paris-Orléans Railway has just placed orders with the Soc. Alsthom, the Soc. Constr. Eléctriques de Jeumont, and the Cie. Gen. d'Electricité for the sub-stations, and for the 130 miles of 90,000-V transmission line with the Soc. l'Entreprise Industrielle, the Cie. Parisienne Electrique, and the Cie. Grands Travaux Industrielles.

Germany.—RAILWAY ELECTRIFICATION PROGRESS.—The Bavarian electrified division is now being added to by the conversion of the Tubingen-Plochingen and Munich-Dachau lines, with a length of thirty-two miles, while the electrification of the fifty-mile Halle-Köchen-Magdeburg section is to be put in hand immediately, thus linking Magdeburg with the Central Germany electrified system of the State railway.

Japan.—RAILWAY ELECTRIFICATION.—Our Yokohama correspondent reports that the Tanna Tunnel is to be opened about October, and electrification of the Kodzu-Numadzu section of the Tokaido line is being speeded up accordingly. The total cost of this electrification is estimated at 2,110,000 yen.

L.N.E. Railway.—DIESEL-ELECTRIC "RAILBUS."—The new Armstrong-Whitworth Diesel-electric "railbus" travelled from Newcastle to London last week, a distance of 268 miles, on thirty-five gallons of fuel costing 4½d. a gallon. The running time was 5 h. 48 m., and the "railbus" stopped at eight signal checks. This compares quite favourably with the 4 h. 55 m. which the "Flying Scotsman" takes on its non-stop run from Newcastle to London. It will seat fifty-seven people, or seventy-one if no luggage compartment is incorporated, and the streamlining saves 30 per cent. in engine power. It is designed for high-speed local services on branch lines.

Manchester.—TRAMWAY ABANDONMENT.—The City Council has decided to abandon the tramways in Rochdale Road and to substitute motor omnibuses.

New Zealand.—LAUNCESTON.—The annual report of the Tramways Department (engineer: Mr. R. J. Strike) for the year ended June 30th, 1932, shows a total revenue of £48,651 (£46,612 in 1931), and a working expenditure of £39,784 (£41,637), leaving a net deficit of £2,557 (£5,799). The car-miles run amounted to 506,635 (514,142), and the number of passengers carried was 4,278,255 (4,559,620).

Northampton.—BUSES TO REPLACE TRAMS.—The Town Council has decided to adopt oil-fuel buses for the Kingsthorpe route in place of the trams. Trolley-buses were considered but rejected owing to the appearance of overhead wiring and cost.

Nottingham.—TROLLEY-BUSES SUPERSEDE TRAMS.—The City Council has recommended that £44,033 be spent on the conversion of several tramway routes to trolley-bus operation.

South Africa.—BLOEMFONTEIN.—The Town Council has appointed a Committee to investigate the town's transport system and its needs. The Council had previously decided to purchase two oil-engined omnibuses as an experiment to discover whether the trolley-bus system should be abandoned.

JOHANNESBURG.—The City Council, on the recommendation of the Tramway & Lighting Committee, has decided to appoint an independent committee to inquire into the municipal transport services. The Committee will consist of three members, one recommended by Lord Ashfield, one by the Electricity Supply Commission, and one, an economist, by the Witwatersrand University Council.

Uxbridge.—TROLLEY-BUSES TO REPLACE TRAMS.—The Development Committee is to make an application for the substitution of trolley-buses for trams to relieve the traffic congestion in the town.

Wakefield.—TRAFFIC SIGNALS.—The Watch Committee recommends the provision of automatic traffic signals at the new bridge at a cost of £870.

Communications

Australia.—REVENUE FROM WIRELESS LICENCES.—It was officially estimated that the Australian Broadcasting Commission would receive nearly £250,000 from wireless licence fees for the first complete year of its operations, ending on June 30th. The Postmaster-General states that listeners' licence fees may be reduced by 3s. from March next, when the payment by the Government to Amalgamated Wireless (Australasia), Ltd., of 3s. from each fee in payment of patent rights will cease.

Egypt.—AUTOMATIC TELEPHONY.—An order has been obtained by Standard Telephones and Cables, Ltd., for the supply of rotary equipment for the conversion of exchanges in Alexandria to automatic operation. The order is valued at £90,000 (Egyptian) and will increase the automatic equipment in Egypt to 31,000 lines.

Glasgow.—TRUNKS ON DEMAND.—An important change-over of all trunk lines terminating in the G.P.O., Glasgow, took place on August 5th. The old switch sections, which had been in operation for over twenty years, have been thrown spare, and two suites of new trunk switchboards manufactured and installed by the General Electric Co., Ltd., take their place. A suite of thirty positions on one side of the trunk switch room carries the outward "trunks on demand" lines, and a suite of twenty-four positions on the other side of the room carries lines on which some delay may be anticipated and also incoming trunks. Trunks on demand lines can be switched over from the no delay suite to the other side if excessive traffic arises suddenly on a route and the existing lines are inadequate to carry it. All trunks are multiplied on the no delay board and also incoming record lines from the local exchanges. A feature of the new system is the method of checking and indicating the time during which a trunk has been engaged for a call. Each cord circuit is fitted on the answering side with a time-check key. When conversation begins, the operator flicks the key backwards to start the time-check, which is driven by twelve second impulses from the master clock. At the end of three minutes, and at the end of every multiple of three, the supervisory lamp on the cord flashes. The operator comes in on the line on the first flash and challenges. Should the period be extended, the same procedure follows at the end of every three minutes. The hanging-up of the receiver by the calling subscriber at the close of the conversation causes the supervisory lamp to glow permanently and, at the same time, stops the time-check. The operator then flicks the key to the display position, and the number of minutes covered by the call comes up on the display strip. This is then entered on the call-ticket and sent by tube to the accounting table.

Great Britain.—RADIO RELAY SERVICES.—In addition to the Barrow-in-Furness Corporation's agreement with K.L.M. Radio Relays, Ltd., to permit wires to cross once over the streets the company has been given permission to run a second crossing over the streets, and approximately 35 ft. high, and at a good distance apart from each other in each street.

Northampton Town Council, after a lengthy discussion, has referred back a proposal of a private company, Messrs. Turner Bros., for a relay scheme for the borough.

London.—TELEPHONY.—The Post Office is diverting about 100 cables, containing something like 70,000 telephone wires, which has been rendered necessary by improvements being made to the Central London Railway at Chancery Lane, Holborn. A new subway has been provided for the cables, and their diversion will take nearly two years to complete, alternative routes being provided meanwhile so as not to interrupt service. The cables are at present in a tube which was originally built seventy years ago for the pneumatic conveyance of parcels.

Sweden.—THE CONFERENCE TELEPHONE.—At the World Power Conference held recently in Stockholm a contrivance, called the "Conference Telephone," was introduced by the L. M. Ericsson Telephone Company. It is a portable wireless receiver of tiny dimensions consisting of a coil antenna, placed around the shoulders, a receiver fixed in the button-hole or placed in a pocket, and a head-phone. The transmitter antenna is mounted around the walls of the conference room, so that the bearer of the receiver outfit can stand anywhere in the room or move about on the floor while listening to the lecture undisturbed by other members of the audience, who can thus converse with each other freely while the lecture is going on. While the principal speaker is talking interpretations are sent over different wavelengths simultaneously for each language. The listener only has to choose a receiver tuned for the wavelength of the language he wishes to listen to.

Switzerland.—RADIO SET INSPECTION.—As from July 1st last, all listeners who have constructed or who construct their own sets and who fix aerials and earths themselves require a post office licence. Specially appointed officials examine every set, to each of which a stamp is affixed after examination. The cost of these tests has to be borne by the listeners, says *World-Radio*, which states this is one of the steps which are being taken to combat the evil of interference with reception.

Syria.—TELEPHONY.—Direct telephone communication has recently been established between Beyrouth and Haifa.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 19th. Telephone transmitters and parts. (A.Y. 11905.)*

September 26th. Telephone receivers and parts. (A.Y. 11916.)*

October 3rd. Telephone cord tags and connection plates. (A.Y. 11917.)*

September 12th. Telephone switchboard plugs (A.Y. 11880)* and condensers (A.Y. 11895.)*

September 9th (extended from August 18th). State Electricity Commission. Paper and varnished-cambric insulated and lead-covered and steel wire armoured cable. Mr. W. J. Price, secretary, Electricity Commission, 22-32, William Street, Melbourne.

Boston.—August 22nd. Corporation. Electrically driven centrifugal sewage pumps. Borough surveyor (deposit £5).

Durham.—County Education Committee. Installation of electric lighting at the Bishop Auckland Poor Law Institution. W. J. Merrett, county surveyor, 20, Old Elvet, Durham.

Egypt.—CAIRO.—September 11th. Controller of Technical, Industrial and Commercial Education. Mechanical and electrical equipment for the Abbassia Technical School.

Irish Free State.—DUBLIN.—August 12th. Board of Public Health. Electrically driven sewage pumping plant. Mr. P. H. McCarthy, 26, Lower Leeson Street.

Kettering.—August 23rd. Urban District Council. Work and equipment in connection with the bulk supply to the works of Messrs. Stewarts & Lloyds, Ltd., at Corby. (August 4th.)

August 28th. 2,000-kVA transformer. (August 4th.)

Kingussie.—August 12th. Town Council. Various works (including electrical) at reconstruction of Victoria Hall. Specifications, &c., from the architect, Mr. J. G. Chisholm, 15, Union Street, Inverness; tenders to Mr. J. Campbell, Town Clerk.

London.—HAMMERSMITH.—August 21st. Electricity Department. Wiring of blocks of tenements. (See this issue.)

Middlesbrough.—September 4th. Three sets of traffic signals. (See this issue.)

New Zealand.—WELLINGTON.—September 12th. Posts and Telegraph Department. Battery plates. (A.Y. 11898.)*

Plymouth.—August 19th. Corporation. Distribution switchgear and battery-charging equipment for the mental hospital, Blackadon, Devon. (July 28th.)

Portsmouth.—August 19th. Electricity Department. (a) Steel air ducts for generating station and (b) construction of overhead e.h.p. and l.p. lines near Wickham. (July 28th.)

Portuguese East Africa.—LOURENCO MARQUES.—September 22nd. Port and Railway Administration. Cable, connecting boxes and terminal boxes. (A.Y. 11909.)*

Rosslynlee (near Edinburgh).—August 26th. Midlothian and Peebles District Asylum Committee. Removal of existing steam and electrical generating plant and supply and installation of new power plant. (July 28th.)

Shipley.—August 25th. Electricity Department. Two 250-kVA transformers and/or automatic voltage regulators. (August 4th.)

South Africa.—CAPETOWN.—September 27th. Electricity Department. 20-h.p. motor-alternator set for meter testing. (A.Y. 11896.)*

August 16th. 5,000 25-A single-pole ironclad service cut-outs. (A.Y. 11893.)* Overhead line material and street lighting spares. (A.Y. 11892.)*

JOHANNESBURG.—City Council. August 17th. Ten miles of bare copper cable for overhead transmission lines. (G. 12787.)* Thirty miles of braided copper conductors for overhead transmission line. (A.Y. 11894.)*

PRETORIA.—August 18th. Government Supplies Board. Thirty-seven stationary batteries. (A.Y. 11902.)*

September 1st. Post Office detectors. (A. 11926.)*

ROBERTSON.—August 23rd. Town Council. 200-kW turbo-alternator set, converting equipment switchgear, cables, overhead line material, transformers, meters, motors and fans. (A.Y. 11904.)*

Sunderland.—September 4th. Electricity Department. Paper-insulated cable, rubber-insulated wire, meters and lamps. (August 4th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Recommended. Electric cookers.—Revo Electric Co., Ltd. 250-kVA transformer.—Ferranti, Ltd.

Beckenham.—Urban District Council. Accepted. Installation of traffic signals at the junction of High Street and Manor Road (£328).—Automatic Electric Co., Ltd.

Bootle.—Highways Committee. Accepted. Electric vehicle battery (£238).—Tudor Accumulator Co.

Parks Committee. Recommended. Electric lighting at buildings on golf course (£128).—Hardacre & Maltpress.

Colchester.—Education Committee. Accepted. Installation of electric lighting at Barrack Street Schools. (£198).—H. E. Gosnell.

Glasgow.—Corporation. Education Committee. Accepted. Electrical work at various schools: Kennedy, Stark & Co. (£700); Dick-Cleland, Bennett & Co., Ltd. (£473).

Transport Committee. Accepted. Armatures for motors.—General Electric Co., Ltd.

Halifax.—Town Council. Accepted. Electrical work in connection with alterations to the transport depôt (£65).—Gath Electrical Engineering Co.

Hull.—Telephones Committee. Recommended. Bronze wire (£223).—F. Smith & Co. Relays (£164).—Ericsson Telephones, Ltd.

Education Committee. Accepted. Electrical installation at Maybury Road School (£255).—Dawber, Townsley & Co. Electrical installation at Pickering Road school (£228).—Miller & Garness.

Keighley.—Electricity Committee. Accepted. Transformers for twelve months.—General Electric Co., Ltd.

Leeds.—Sewerage Committee. Accepted. Reconstruction internal telephone system at Knostrop works (£98).—Green and Smith, Ltd.

Electricity Committee. Accepted. Cables.—Edison Swan Cables, Ltd. (£1,084); Macintosh Cable Co., Ltd. (£492); W. T. Henley's Telegraph Works Co., Ltd. (£372); Metropolitan Electric Cable & Construction Co. (£378).

Watch Committee. Accepted. Traffic signals.—Automatic Electric Co., Ltd. (£1,239).—Chance & Co., Ltd. (£251).

Saltcoats.—Town Council. Accepted. Floodlighting and strip-lighting equipment for the Saltpans bathing station at Melbourne Park.—General Electric Co., Ltd.

Sheffield.—Health Committee. Recommended. Electric bed lift at general hospital (£317).—Keighley Electrical Engineering Co., Ltd.

South Shields.—Town Council. Accepted. Transformers.—Metropolitan-Vickers Electrical Co., Ltd. Electrical installation and wiring of 142 houses, Green Lane (£315).—Sturgeon & Co.

Swansea.—Electricity Committee. Accepted. Switchgear for the Swansea civic centre (£660).—Switchgear Construction Co., Ltd.

Wakefield.—Electricity Committee. Accepted. Testing equipment (£173).—British Insulated Cables, Ltd.

Housing Committee. Accepted. Wiring 80 houses on the Darnley estate.—H. Goodyear.

Weymouth.—Town Council. Accepted. Rotary convertor (£3,215).—English Electric Co., Ltd. Mains extensions, South Hill to Two Mile Copse (£1,087).—Johnson & Phillips, Ltd.

Wolverhampton.—Education Committee. Accepted. Renewal of electric lighting installation at Old Hall Street school (£438).—Burns & Dudgon.

Worthing.—Buildings Committee. Accepted. Rewiring Sussex Road School (£73).—Phillips & Dart.

Electricity Committee. Accepted. Sub-station equipment (£2,634).—Hewittic Electric Co., Ltd.

York.—Corporation. Accepted. Erection of overhead lines between Sheriff Hutton and Stillington.—Johnson & Phillips, Ltd.

The Volk Electric Railway Jubilee

The famous electric railway which runs along the Brighton front celebrated its Jubilee on August 4th, when the Mayor of Brighton drove an electric train along the whole length of the route from the Aquarium Station to Black Rock, thus marking the beginning of the second fifty years of operation.

Mr. Magnus Volk with his family and the Mayor and Mayoress of Brighton at the Volk Electric Railway Jubilee Celebrations

Mr. Magnus Volk, the founder, the celebration of whose eighty-first birthday was recorded in our issue of October 28th last (page 655), attended the ceremony and travelled on the Jubilee journey. This electric railway was the first in Great Britain, and is the first in the world to celebrate its Jubilee. Mr. Volk has been the recipient of telegrams of congratulation from all parts.

Notes

New Moulding Composition

According to *Zeitschrift des Vereines deutscher Ingenieure*, a new moulding composition, "Kolonit," has been made at the Kaiser Wilhelm Institute for Coal Research, Mulheim-Ruhr. The new composition is claimed to cost only about ½d. per lb. for raw material and slightly more than ¾d. per lb. when ready for moulding to any desired form. It can be worked by hand or machine tools, takes a high polish, is weather-resisting, and is said to be a better electrical insulator than "Bakelite." As at present made, "Kolonit" is prepared by kneading dried and ground brown coal or lignite with about 12 per cent. of cresol, the latter being dissolved in a volatile solvent. The mixture is kept at about 176 deg. F. for some hours during the kneading process, and meanwhile swells to twice its original bulk. The solvent is then distilled off, and the composition is heated to 300 deg. F. prior to moulding under high pressure. Further research is expected to lead to the preparation of yet better compositions from peat and black coal.

Street Lighting at Forest Hill

A new street-lighting installation which the South Metropolitan Electric Light & Power Co., Ltd., is demonstrating in Park Road, Forest Hill, S.E., comprises eight steel columns 30 ft. high and spaced 155 ft. apart, each fitted with a projecting bracket from which the lantern is suspended 6 ft. over the roadway at a height of 26 ft. The lantern is of special design and contains an "Osira" lamp (G.E.C.) and a number of prismatic lenses so arranged as to throw a greater amount of light in one direction than the other. Thus each lantern emits approximately 3,000 c.p. in the direction of on-coming traffic and practically double this amount in the opposite direction. In this way glare is minimised and the illumination of the road surface is made more even in the right direction to assist traffic.

The base of each standard contains the necessary control gear for the lamp, which has no filament. The source of light is an electrical discharge through a short glass tube containing a special gas, the light efficiency being from 2.5 to 3 times that of an ordinary filament lamp. The colour of the light is pale bluish, and may be likened to bright moonlight. The light emission is steady and regular, while the lanterns need little maintenance, cleaning, &c., and the lamps have a longer life than ordinary ones.

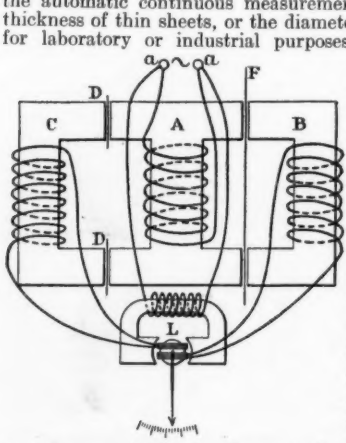
The Park Road installation has been so designed that the large lamps can be switched out at midnight when traffic diminishes, small pilot filament lamps fixed on brackets at a height of 16 ft. then automatically come into commission.

A New Insulator

Under the name "Sinterkorund," the Siemens & Halske Co., of Berlin, has recently introduced a new ceramic material consisting of pure aluminium oxide which is intended to be used in particular for the insulators of sparking plugs. The plugs equipped with this material are reported to have proved perfectly reliable for everyday use in motor vehicles. Due to its superior chemical resistivity and mechanical strength, even at very high temperatures, "Sinterkorund" has also proved a highly suitable manufacturing material for appliances used in chemical laboratories, such as crucibles and cups. Being perfectly gas-tight, even at temperatures exceeding 3,000 deg. F., the material is also suitable for protective tubes for pyrometers.

An Automatic Magnetic Micrometer

The accompanying illustration, from *Revue Générale de l'Electricité*, shows the essential features of a new device for the automatic continuous measurement and recording of the thickness of thin sheets, or the diameter of fine wires, whether for laboratory or industrial purposes. As described by M. Pierre Bricout in a note presented to the French Académie des Sciences, the apparatus reduces the measurement of thickness to the comparison of two e.m.f.s. The micrometer element comprises a transformer with a core in three parts as shown. The primary winding on A is excited from a source *a a* of alternating current which is also used to excite the field magnet of the moving-coil instrument L. The moving system of the latter has two coils connected respectively to the secondary windings on B and C. The flux in core A is practically constant, and divides between the cores B and C in inverse proportion to the reluctance of each branch. The cores being of high permeability metal, the reluctance of each branch is determined almost entirely by the length of the air gaps. Gauge pieces of non-magnetic material of known thickness are placed in the gaps D, and the material F to be measured determines the length of the gaps between A and B. Actually, the cores are in contact with D and F and exert upon them a uniform pressure. Under these conditions, the ratio of the fluxes in B and C, and therefore the deflection of L, depend only on the thickness of F. The instrument L can be calibrated to read directly the thickness of F, and various ranges can be obtained by shunting the windings and changing the gauge pieces D. If desired, variations in thickness of the order of 0.1 micron can be detected, or the apparatus can be used to measure small displacements, such as the expansion of a solid or the movement of a manometric capsule. Both D and F must be non-magnetic or of material the permeability of which is nearly equal to that of air.



Electricity Production in France

The official annual return drawn up by the French Ministry of Public Works of the electricity production in France during 1931 has lately been issued. The return, which leaves out of account all plants of less than 1,000 kVA capacity, gives a table which shows the installed capacity and output of the hydro-electric, steam, and internal-combustion engined power stations in each of the Departments of France. The total installed capacity of the hydro-electric plants at the end of the year under review was 6,210,792 kW, the normal available capacity 4,312,142 kW, and the output during the twelve months 8,379,304,000 kWh. For steam and i.c.-engined power stations the installed capacity was 2,441,584 kW, normal available capacity 1,152,999 kW, and output 5,981,446,000 kWh. The total output of 14,360,750,000 kWh, was disposed of as follows: Traction, 335,966,000 kWh; electro-chemical and electro-metallurgical, 1,077,545,000 kWh; other uses, 2,471,153,000 kWh; supplied to distribution systems, 10,476,086,000 kWh.

A further table shows the length of the transmission lines in the different Departments, and still another the electric power absorbed during the year in French towns with a population of over 80,000. An interesting item of information in the return is that, out of 38,004 communes throughout France, there were at the commencement of 1932 6,299 (with a total population of 2,529,299) not provided with electric power supply, but by the beginning of the present year (1933) there were only 1,437 communes (1,643,322 inhabitants).

An Unusual Sub-station

With reference to the note appearing under the above heading in our issue of July 28th (p. 138), Messrs. G. W. Franklin & Son inform us that the sub-station was designed by Mr. Louis de Soissons, of Blue Ball Yard, St. James's Street, S.W., who also designed the block of flats.

Improved Concrete for Electrical Insulation

A special type of concrete, devised by E. Lambert and described in *Revue Générale de l'Electricité*, is claimed to offer important advantages when a moderately high dielectric strength is required in pieces of large dimensions. The new material is the outcome of prolonged investigations sponsored by the French P.L.M. Railway, and its primary applications are to third-rail insulators, suspension insulators, and similar purposes. It appears, however, that the Lambert concrete will also find many other uses, for it is inexpensive and free from the hygroscopic properties which render ordinary concrete practically worthless as an electrical insulating material. The ingredients are cement of the *ciment fondu* type, specially selected and graded sand and gravel, the minimum quantity of water, and a special bituminous emulsion. Large insulating blocks for furnaces or electrical machinery need no special treatment, but an appropriate heat treatment and varnishing are recommended for smaller insulators in order to develop maximum insulating properties and secure full immunity against rain and weather.

The mechanical properties of the new concrete resemble those of ordinary concrete. Its electrical resistivity is higher than that of slate, marble and fused basalt, but lower than that of porcelain and electrical glass. The dielectric strength is of the order of 10 kV per cm., and is thus comparable with that of marble. After being punctured, the material can be "regenerated" and has then practically its initial properties. It will not withstand boiling water, but is unaffected by dry heating to 100 deg.-150 deg. C.

Third-rail insulators made of the new concrete have been tested in service by the P.L.M. Railway for more than eighteen months with satisfactory results. The working voltage being 1,500 V, d.c., the flash-over voltage from rail to earth is about 77,000 with dry insulators. After 45 minutes' immersion in water, the flash-over voltage was 28,000, the insulator being dripping wet, 36,000 V one minute later, and 41,000 V after three minutes.

It is believed that relations discovered in the course of M. Lambert's investigations will result in the perfection of an electrical method for testing ordinary concrete *in situ*.

Appointments Vacant

Lady showroom assistant for Burnley Electricity Department.

Electrical and mechanical engineer for Hereford County and City Mental Hospital.

Borough electrical engineer for Conway.

(See our classified advertisements.)

Makers' Names Wanted

Excellite insulating material.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. O. McMillan, of the English Electric Co., Ltd., at Bradford, was married at Brighton on July 29th to Miss Craigie Howitt Moore. He was presented by the management and control staff with a walnut drawing room clock.

Mr. H. Bright, M.A. (Cantab), who has been assistant to Mr. A. F. W. Richards, consulting engineer, for over two years, has been taken into partnership by Mr. Richards. They will continue to practise as consulting engineers at 150, Southampton Row, W.C.

Mr. T. G. Otley, assistant general manager and mechanical engineer of the Victoria Falls & Transvaal Power Co., Ltd., has arrived in England.

Mr. J. P. Tucker, engineer and manager to the Isle of Man Electricity Board, whose scheme was inaugurated on August 3rd (see p. 187).

Elsewhere in this issue we describe the electricity scheme for the Isle of Man and the accompanying illustration shows a silver replica of the 50 kVA transformers which were specially designed and produced by Messrs. Johnson & Phillips, Ltd., for the scheme. This souvenir forms a silver cigarette case, and was presented by Mr. C. Stuart, director of the company, to Sir Claude Hill, Governor of the Isle of Man, following the "switching on" ceremony which took place on August 3rd.

A replica of the J. & P. transformers designed for the Isle of Man electricity scheme

The signing of the contract for the electrification of the Polish State Railway (see page 195). Left to right: (seated) Mr. C. S. Richards (director, Metropolitan-Vickers Electrical Export Co., Ltd.), Col. Adam Koc (Under-Secretary of State in the Polish Ministry of Finance, Poland), Mr. G. H. Nelson (chairman and managing director, English Electric Co., Ltd.), and Sir Holberry Mensforth (director, English Electric Co., Ltd.). (Standing) Mr. G. M. Bailey (director, Metropolitan-Vickers Electrical Export Co., Ltd.), Mr. W. Domaniewski (Financial Councillor to the Polish Embassy in Paris), and Dr. Jerzy Nowak (director, Ministry of Finance, Poland)

Mr. H. P. Ward, a member of the staff of the Standard Telephone & Cables, Ltd., Brighton, who was married on July 29th to Miss R. L. Clarke, has been presented by his colleagues with a cheque.

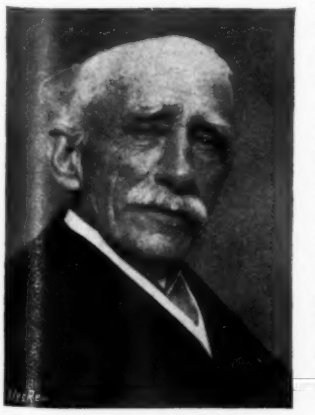
Mr. Stanley Clegg, who has retired as chief electrical engineer to Lincoln Corporation, has been presented by the staff with an antique bureau. The presentation was made by Mr. A. Letts, assistant electrical engineer, at a recent social gathering, the guests including Mr. F. Newey, who succeeds Mr. Clegg.

Mr. S. Scholefield has been appointed by the Stone (Staffs) Urban District Council as manager and engineer of the Electricity Department, with Mr. R. C. Hannersley as clerk. The services of Mr. Selvey and Mr. Wadeson will be retained in an advisory capacity.

Mr. J. S. Nicholls, who during the past four and a half years has represented the Carron Company (Electric Cooker and Heating Department), in London and on the South Coast, has joined British National Electrics, Ltd., as London sales representative, and will operate from the company's London showrooms at 5a, Berners Street, W.1.

Mr. G. W. Gough, who has for 12 years been on the staff of the Barnes Corporation Electricity Department, was recently married, and has been presented by his colleagues with a canteen of cutlery. The presentation was made on July 26th by Mr. C. S. Davidson, the borough electrical engineer.

Sir J. Ambrose Fleming, F.R.S., was married on July 27th, at St. Pancras Church, London, to Miss Olive May Franks, of Bristol. His first wife died in 1917.



[Elliott & Fry

Sir J. Ambrose Fleming

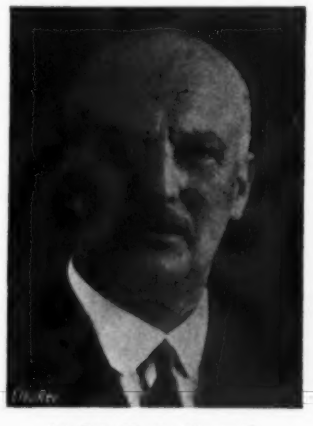
Mr. E. F. Hetherington, chief engineer and manager to the West Midlands Joint Electricity Authority, who recently underwent an operation, is, we are glad to learn, making a satisfactory recovery.

M. David A. Soulier, the editor-in-chief of our French contemporary, *L'Industrie Electrique*, has been appointed a Chevalier of the French Legion of Honour.

Mr. T. Hesketh, who has for thirty-seven years been managing director of the Folkestone Electricity Supply Co., Ltd., has retired with a view to renewing his activities in private research work.

He will, however, retain his seat on the board of directors. He is succeeded by Mr. N. Gadstone, with Mr. P. V. Gurr as commercial manager.

Lieut.-Colonel K. G. Maxwell, M.I.E.E., M.C., has been appointed manager of publicity of Metropolitan-Vickers Electrical Co., Ltd. He was educated at Hobart, Tasmania, and received his early works training there, completing his technical training at the Manchester College of Technology. He joined the British Westinghouse Company in 1911 as a junior engineer in the transformer department. In August, 1914, he took a commission in the Manchester Regiment, and commanded the 5th Battalion of this regiment during the main enemy offensives of March, 1918. On demobilisation he rejoined the company (now Metropolitan-Vickers) and was engaged in the research department, under Mr. A. P. M. Fleming, in the investigation of insulating materials. At that time British sources of supply were replacing pre-War foreign sources, and investigations into the suitability of the British insulating materials had to be made rapidly and thoroughly. The paper which he presented to the I.E.E. in conjunction with Mr. Alan Monkhouse, of Moscow fame, gained the Kelvin



Lt.-Col. K. G. Maxwell

premium 1925. Col. Maxwell has worked as a member of the B.S.I. Technical Committee on Insulating Materials and on a number of sub-committees, particularly those investigating synthetic resin products and insulating oils, as well as on the Electrical Research Association. He has taken an active part in the selection and training of M.V. apprentices.

Obituary

Monsieur M. Ulrich.—The death has occurred at Courley-sur-Mer, Charante, at the age of 53 of M. Marcel Ulrich, chairman of the Paris Underground Railway. He commenced his career in 1902 as a mining engineer and in 1911 he turned his attention to railways. After the war he became interested in the electrical industry, particularly in connection with underground railways, becoming chairman of the Paris "Metro" at the beginning of the current year. The extensions towards the suburbs now in hand are based on a programme which he prepared. In the electricity supply field he took an active part in developments in Paris, and was responsible for a supply being provided to the city from hydro-electric stations in the Provinces.

Mr. T. J. Grainger.—Mr. Thomas John Grainger, who collapsed while bathing on Monday at Holy Island where he was on holiday, had been connected with the electrical industry for very many years. We particularly recall his early service rendered in connection with the original electrical manufacturers' association when he attended, as representing the Sunbeam Lamp Co., the small meetings held at the Hotel Cecil in London, gatherings now only remembered by a few. Mr. Grainger was managing director of T. J. Grainger, electrical factors, of Eldon Square, Newcastle-on-Tyne. He played a prominent part in the life of Gateshead and was a J.P. He was sixty-four years of age. The funeral took place yesterday.

Mr. L. A. O'Brien.—Messrs. O'Brien and Hulme, of Manchester, wish to express their gratitude to the many friends who kindly sent expressions of sympathy on the death of their Mr. L. A. O'Brien.

Will.—Mr. R. J. Hatton, M.I.M.E., M.I.E.E., a director of Messrs. W. T. Henley's Telegraph Works Co., Ltd., left £30,691 (net personalty £29,918).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

The Donovan Electrical Co., Ltd., was registered as a "private" company on July 28th, with a nominal capital of £50,000 in £1 shares. The objects are to carry on the business of manufacturers of and dealers in electrical, mechanical, marine, aeronautical, agricultural and automobile equipment and fittings, accessories and appliances, and wireless and television equipment, appliances and accessories, gramophones, telephones and other goods, materials and articles, &c. The first directors (to number not less than two or more than eight) are: George O. Donovan, 31, Silverbirch Road, Erdington, Birmingham; Walter Donovan, "The Hawthorns," Birmingham Road, Wylde Green, Warwickshire; Eric T. G. Donovan, 355, Birmingham Road, Wylde Green, Warwickshire; Walter Donovan, Junr., 31, Silverbirch Road, Erdington, Birmingham; and William H. Varnom, 58, Willow Road, Bournville, Birmingham. Registered office: 47, Great Charles Street, Birmingham.

Heywood Relay Services, Ltd.—Private company. Registered August 3rd. Capital, £2,000 in £1 shares. Objects: To acquire a right granted to Romneys (Bury), Ltd., to carry certain wires across the highways in Heywood for the purpose of relaying home entertainment, and to carry on the business of electricians, mechanical and wireless engineers, &c. The directors are: Joseph H. Law, 113, Foxholes Road, Rochdale, and Louis Myers, 52/54, Market Street, Heywood. Solicitors: Jackson & Co., Rochdale.

Cyntra Electric Supplies, Ltd.—Private company. Registered August 3rd. Capital, £300 in 1,000 preferred ordinary shares of 5s. and 1,000 deferred ordinary shares of 1s. each. Objects: To carry on the business of electrical engineers, electric clock and general electric appliance manufacturers, jewellers, clock and watch manufacturers, &c. The directors are: Gertrude C. Berrage-Moulton, 12, Buckland Crescent, N.W.3, and Chas. V. Lovely, 38, Barons Court Road, W.14. Registered office: Sentinel House, Southampton Row, W.C.1.

Page & Girling, Ltd.—Private company. Registered August 4th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electricians, electrical engineers and contractors, &c. The directors are: David A. Page, 179, Clitheroe Avenue, W.7, and Howard M. C. Girling, "Windwhistles," Donnington Road, Kenton, Middlesex. Secretary: C. S. Thorne, 273, Willesden Lane, N.W.

Milnes Radio Co., Ltd.—Private company. Registered August 2nd. Capital, £10,000 in £1 shares (1,000 10 per cent. cumulative preference and 9,000 ordinary). Objects: To acquire the business of a radio component manufacturer, carried on by Henry R. Milnes, at Victoria Works, Bingley, Yorks. The permanent directors are: Henry R. Milnes (chairman), 7, Ashley Road, Bingley, Yorks; Mrs. Nellie Milnes, 7, Ashley Road, Bingley, Yorks; James C. Suddards, 22, Highfield Road, Frizinghall, Bradford. Secretary: Wm. Grossert. Registered office: Victoria Works, Bingley, Yorks.

Intensive Lighting, Ltd.—Registered August 1st. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers and importers of all kinds of electrical goods and equipment, electrical and mechanical engineers, &c. The directors are: Marjorie K. Smith, Sandygate, Wath-upon-Dearne, Yorks; Galantha M. Cuthbert, 18, Ridgmount Gardens, W.C.1. Secretary: Galantha M. Cuthbert. Registered office: 4, Featherstone Buildings, High Holborn, W.C.1.

Returns of Electrical Companies

Selsey Electrical Co., Ltd.—Satisfaction in full on July 22nd, 1933, of mortgage dated May 27th, 1931, and registered May 28th, 1931. (According to the register of mortgages, the mortgage registered May 28th, 1931, originally secured £850.)

Mortgage on house, shop and premises at Selsey, Sussex, dated July 22nd, 1933, to secure £800. Holder: Mrs. M. L. Morris, 5, Audley Road, Folkestone.

Camille Espir, Ltd.—Debenture dated July 22nd, 1933, to secure all moneys due or to become due from the company to the chargees. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holders: Debenture Trustee and Reversion Association, Ltd., 9/11, Copthall Avenue, E.C.

Radio Vacuum Cleaners, Ltd.—R. H. Stevens, 37, Walbrook, E.C., was appointed receiver and manager on July 15th under powers contained in debenture dated July 17th, 1929.

Deco Radio Products (Hampton), Ltd.—Debenture dated July 12th, to secure £250, charged on the company's property, present and future, including uncalled capital. Holder: Mrs. E. M. Pike, 325, Seely Road, Tooting, S.W.17.

Western Wireless & Electrical Co. (Salisbury), Ltd.—J. R. Layton, Crown Chambers, Salisbury, ceased to act as receiver and manager on July 10th, 1933.

Corlett Electrical Engineering Co. (1933), Ltd.—Particulars filed of £125 debentures authorised July 18th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Telephone Berliner (London), Ltd.—Capital, £1,000 in £1 shares. Return dated May 23rd, 1932 (filed May 27th, 1933). All shares taken up. £1,000 paid. Mortgages and charges, £900.

Whitecroft Instrument Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 24th, 1933. 150 shares taken up. £100 paid. £50 considered as paid. Mortgages and charges, nil.

Wilfrid Francis & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated June 28th, 1933. 753 shares taken up. £753 paid. Mortgages and charges, nil.

Painter & Madew, Ltd.—Satisfaction to the extent of £800 (total principal moneys borrowed) on June 30th, 1933, of equitable deposit of deeds dated April 15th, 1930, and registered May 5th, 1930.

Anti Vibration Electric Lamp Co., Ltd.—J. H. G. Peterken, 13, Fish Street Hill, E.C.3, was appointed receiver and manager on June 30th, 1933, under powers contained in debenture dated January 17th, 1923.

Thomasson & Co. (Shrewsbury), Ltd.—Debenture, dated June 21st, 1933, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: F. J. Harper, 30a, Tower Chambers, Pride Hill, Shrewsbury, and F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

Grimston Electric Tools, Ltd.—Debenture dated July 3rd, 1933, to secure £1,000, charged on the company's undertaking Holder: F. Plutte, Lincoln House, High Holborn, London, W.C.1.

Pennington, Stevens & Taylor, Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £5,000.

Hart Bros. Electrical Manufacturing Co., Ltd.—Issue on July 31st, 1933, of £500 debentures, part of a series already registered.

Cifel Products, Ltd.—Debenture dated July 24th, 1933, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. Lewis, 59, Borough High Street, S.E.1.

David Shanks & Co., Ltd.—Second debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 20th, 1933, to secure all moneys not exceeding £1,000, which the chargees may be called upon to pay to the National Bank, Ltd., under guarantees. Holders: W. Scorer, 79/81, Worcester Street, Birmingham, and R. I. Scorer, 9, Chantry Road, Moseley, Birmingham.

Electric Motors (South Wales), Ltd.—Further charge by way of mortgage on properties in Cardiff, dated July 1st, 1933, but actually created July 21st, 1933, as appears by Statutory Declaration, to secure £2,616 18s. Holders: Branksome Chine

Steamship Co., Ltd., of Cardiff, and C. W. Jones, of 56, Victoria Road, Penarth.

British Hanovia Quartz Lamp Co., Ltd.—Capital, £25,000 in £1 shares. Return dated April 24th, 1933. All shares taken up. £20,500 paid, £4,500 considered as paid. Mortgages and charges, nil.

Ringwood Electric Supply Co., Ltd.—Capital, £15,000 in £1 shares. Return dated May 4th, 1933. 11,356 shares taken up. £11,356 paid. Mortgages and charges, nil.

Alliance Electrical Co., Ltd.—Capital, £10,000 in £1 shares. Return dated June 15th, 1933. 3,854 shares taken up. £1,927 paid, £1,927 considered as paid. Mortgages and charges, nil.

Westward Electrical Co. (1928), Ltd.—Capital, £3,000 in £1 shares. Return dated May 26th, 1933. 2,235 shares taken up. £735 paid, £1,500 considered as paid. Mortgages and charges, nil.

Electric Heating & Hardware, Ltd.—Satisfaction in full on June 5th and July 3rd, 1933, respectively, of debenture and collateral mortgage, both dated July 24th, 1930, and registered August 2nd, 1930.

Northern Radio Distributors, Ltd. — The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

Electric-Therapeutic Supply Co., Ltd.—D. Lewis, of Kennans House, Crown Court, Cheapside, E.C.4, ceased to act as receiver and/or manager on July 26th, 1933.

Broadcast Relay Service, Ltd.—Particulars filed of debentures to secure £150,000, with a premium of 5 per cent. authorised June 13th, 1933, and covered by trust deed dated July 22nd, 1933, charged on the company's undertaking and property, including any uncalled capital, the whole amount being now issued. Trustees: Messrs. Hoare, 37, Fleet Street, E.C.4.

Nuvolion Electrics, Ltd.—Particulars filed of £2,000 debentures authorised July 24th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Electro-Plant, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1932 (filed February 7th, 1933). Two shares taken up. £2 paid. Mortgages and charges, nil. A return of allotments, made up to January 26th, 1933, shows a further 598 shares allotted, payable in cash and fully called up.

Electric & Ordnance Accessories Co., Ltd.—Capital, £50,000 in £1 shares. Return dated April 24th, 1933. All shares taken up. £2 paid, £45,000 considered as paid. Mortgages and charges: £10,000.

City Notes

Christy Bros. & Co., Ltd.—Presiding at the annual meeting held on August 2nd, Mr. F. Christy (chairman) said the business had gradually expanded for the last fifty years, and they hoped that the trade of the country would bring continual growth in the future. The largest of their associated companies, the North Somerset Electric Supply Co., Ltd., was continuing to grow very satisfactorily. The next largest undertaking was the West Devon Electric Supply Co., Ltd., which was in the early stages of development. It was expected that a public issue of that company would be made in the autumn. Thirteen small non-statutory electric supply undertakings were being merged into one comprehensive scheme. The smaller undertakings under their management at Aldeburgh, Bude, Burnham-on-Sea, Culm Valley, Holsworthy, and Mid Somerset were all developing satisfactorily. The contracting department, which carried out the electrification of mills, factories, &c., was fairly well employed considering the general state of trade, and they were developing a new department for wireless relay services. They had installed a system at St. Neots about eighteen months ago, and had already over 200 houses connected. An offer for a similar but larger scheme to the Chelmsford Corporation had been accepted, and they hoped to have it in operation before the winter.

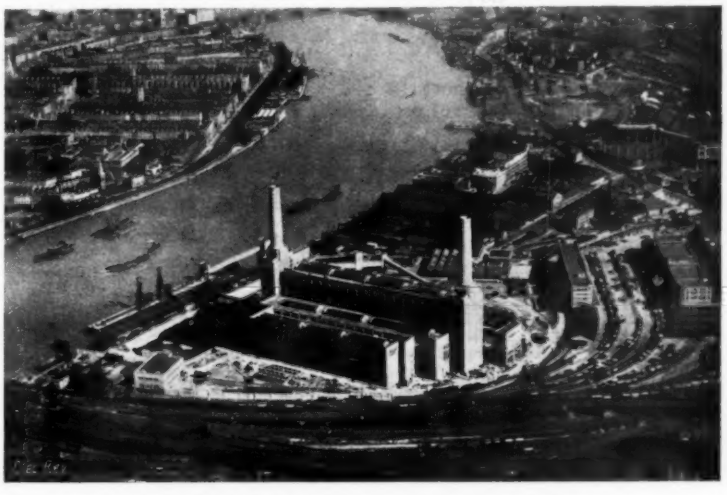
E. K. Cole, Ltd., report that for the sixteen months ended May 31st last the trading profit was £36,519, and after providing for depreciation, income tax, &c., there was a net loss of £22,601, as against a net profit of £106,044 for the twelve months ended January 31st, 1932. In addition the preference dividends for the year to Febraury 1st last took £12,913. These items are covered by withdrawing £20,000 from general reserve and by reducing the balance carried forward from £20,542 to £5,028. Nothing has been included in the accounts in respect of an insurance claim for loss of profits arising out of and consequent upon the fire at the works in February, 1932. The directors state that sales have been well maintained and for the period exceeded £1,000,000. Trading profits were affected in part by general conditions in the industry and particularly by the disorganisation resulting from the fire at the works.

The East African Power & Lighting Co. reports a profit for 1932 of £71,606 (including £11,722 profit on realisation of investments), which with £5,473 brought in makes £77,079. The following appropriations have been made: Depreciation, £17,500; general reserve, £7,500; written off preliminary development account, £550. It is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. for the year, and to carry forward £9,628. The report states that the output has increased in the Nairobi area, but in Mombasa, where the depression has been felt more acutely, both the output and revenue have decreased. During the year the company acquired control of the Tanganyika Electricity Supply Co.

The Nigerian Electricity Supply Corporation, Ltd., has made an issue of £220,000 of six per cent. first mortgage debenture stock. This forms part of an authorised amount of £300,000 of stock and it has been purchased at 93 per cent. by the Power Securities Corporation. It is redeemable by the operation of a cumulative sinking fund of 3 per cent. commencing in 1935, and any stock not previously redeemed will be repayable at par in 1953. Part of the proceeds will be applied in the purchase of a further hydro-electric power station at Kwall and the balance will be available for general purposes.

The Reading Electric Supply Co., Ltd.—Negotiations for the purchase of the company's undertaking by the Reading Corporation have been completed, the purchase price being £443,000. The company is controlled by the Greater London and Counties Trust, Ltd., and the proceeds of the sale will be used for normal developments.

Lissen, Ltd., has announced a dividend at the rate of 8 per cent. per annum on the preference shares for the half-year ended June 30th. The directors state that there has been a substantial increase in the sales from January 1st last, as compared with the corresponding period of a year ago.



An aerial view of the new Battersea power station

The Northampton Electric Light & Power Co., Ltd., has declared an interim dividend of 4 per cent. on the ordinary shares.

The Clyde Valley Electrical Power Co. has announced an interim dividend of 3 per cent., less tax, on the ordinary shares (same).

The Rushden & District Electric Supply Co., Ltd., has declared an interim dividend of 3½ per cent.

The Brompton & Kensington Electricity Supply Co., Ltd., has declared an interim ordinary dividend of 3½ per cent.

The Hydro-Electric Securities Corporation is paying the usual half-yearly dividend on the 5 per cent. class "B" cumulative participating preferred shares.

The Yorktown (Camberley) & District Gas & Electricity Co. has declared an interim consolidated ordinary dividend of 3⅛ per cent.

The Bristol Tramways & Carriage Co. has declared an interim ordinary dividend of 2 per cent. (same).

Stocks and Shares

TUESDAY EVENING.

WITH summer holidays in full swing, and with weather conditions more fitted for bathing pools than for the consideration of finance, it is not surprising to find the Stock Exchange markets in a state approximating languor. For the first time in history, the Stock Exchange has seen in the House a few of its members divested, during business hours, of jacket and waistcoat. The Stock Exchange is ventilated by an elaborate system which includes the circulation of ice-cooled air in the summer time. In spite of all that is done in this and other ways, the atmosphere within the Stock Exchange at four o'clock on a business day when the thermometer is standing about 80 and four thousand men are thankfully trooping out of the markets, is not of the kind that invites polite notice from one of those thousands.

New Issues

The movement in the direction of selling fixed-interest stocks has been arrested, and gilt-edged securities show a good many recoveries. A large loan offered by Canada was so eagerly stagged that its success led to rumours arising as to probable new issues from other borrowers. That there will be a good many new issues in the forthcoming autumn is already well known. The remarkable rush for Canada's fifteen million pounds of 4 per cents., offered at 100, may be expected to accelerate the pace to which the newcomers were set. It is certain that investment will now gladly take any good security at a reasonable price, preference being given to those stocks carrying a definite date of repayment. Investors are undoubtedly a little chary of irredeemable stocks in whose prices there

resides the risk of depreciation if money were to become dearer through any material expansion in trade.

Electricity Supply

Midland Counties Electric eased off to 35s., there having been some change-over of these shares into Midland Electric Corporation for Power Distribution. The latter company, as mentioned last week, has lately obtained an extension of its Order for forty years. This helped to draw attention to its shares, which, on the current dividend of 8 per cent., yield rather over 4 per cent. on the money. The Midland Counties Company is paying 7 per cent., and at the present price the return comes to 4 per cent.

North Metropolitans are a little better at 56s., and Westminsters at 32s. 6d. Chelseas, at 32s., are now the cheapest shares in their own particular group. Electrical Distribution of Yorkshires are $\frac{1}{8}$ higher at 43s. 9d. North Eastern ordinary at 31s. 6d. have gained the pence. Chiswicks hold their price at 46s. 9d., and Richmond (Surrey) keep firm at 52s. 6d. West Gloucestershire ordinary stock appears to have taken up its position at 63.

London Passenger Transport

The London Passenger Transport stocks are in course of being distributed in exchange for those in the companies that comprise the amalgamation. Holders of these latter stocks and shares may be advised to present their certificates without delay, in order that the registers of the new stocks may be completed at the Bank of England. From our price-lists there have been removed, this week, Central London stock and Underground Electric Railway shares. The "C" stock of the new Board has rallied a point to 78, and, in the present temper of investment, may see a further improvement. Against this prospect has to be set the slight mistrust of combine stocks that owes its origin to the experience of investors who were given Cables & Wireless issues in exchange for stocks in the Eastern, Eastern Extension and Western Telegraph companies. Heavy depreciation followed this change-over. It is not fair, however, to press the analogy very far. The London Passenger Transport plan was worked out upon quite a different basis from that adopted in the case of the cable companies.

Cables and Wireless

It is of some interest to recall that not so long ago £100 of each class of Cables and Wireless stock could have been bought in the market for £100 cash. At to-day's levels, £100 Cables preference, "A" ordinary, and "B" ordinary, would cost nearly £130. To-day's figure rests upon anticipations of increased trade throughout the world, and is encouraged by the partial payment on account of the arrears of dividends due upon the preference issue. In other words, speculation is playing its part in the firmness shown by the prices, just as investment is responsible for the advances secured last month by Anglo-American Telegraph preferred and deferred stocks. Great Northern Telegraphs also continue to be absorbed by the investor: the shares at 32½ are 10s. higher on the week. American Telephone & Telegraphs are moving in correspondence with the tendency in Wall Street. The price is 2 points up at 137½, the Internationals are dull, and at 16½ show a small decline.

Associated Equipment

Particulars were given here last week of the starting of a market in the shares of Associated Equipment, the company, which for years past has supplied the buses, lorries, &c., to the Underground Electric Railways group. The shares are of £1 each, and dealings began on the basis of 30s. to 31s. Attention was attracted by reason of the yield that this provided, and the price rose to 34s., reverting to 33s. 6d., at which, on the basis of last year's 7½ per cent. tax free dividend, the return is £4 10s. 6d. per cent., equal to a shade over 6 per cent., taking income tax at 5s. in the £. The transactions are still subject to permission to deal being given by the Stock Exchange Committee. English Electric ordinary are easier at 10s. Details are now published of the important Polish contract recently secured by the company in conjunction with the Metropolitan-Vickers Electrical Export Company.

Miscellaneous Matters

Recurrence of investment demand for fixed-interest stocks is responsible for a rise of 4½ points in British Electric Traction preferred ordinary. This has lifted the quotation to 142½. The deferred stock remains at 420. A number of preference shares in the electricity groups are better, amongst them being Edmundson's 6 per cent. preference which are 1s. 9d. up at 29s.; smaller improvements have been secured by Lancashire 7 per cent. preference at 34s., and Midland Electric Corporation Sevens at 32s. 6d. The ordinary shares of the North Metropolitan Electric Company offered as rights to shareholders in the Underground Railways, are quoted at 14s., a rise of 1s. The Atlas shares are dull at 9s. 6d. Telephone Manufacturing are 4½d. up at 4s. Calcutta Electrics strengthened to 52s. Movements in the dollar stocks are narrow; Brazilian Tractions at 14⅞ show a small fall. The iron and steel market is steady, but there are no changes of any consequence to record. International Automatic Telephone ordinary shares are 1s. better at 44s., the "B" deferred shares being quoted at 40s. 6d. The rubber share market has fallen once more upon quiet days.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1931.	1932.	Price, Aug 8.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	75/-	—	4 0 0
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	105	—	4 5 9
Charing Cross Ordinary	1	8½	7	33/0	—	4 4 10
Chelsea	1	8¾	7	32/-	—	4 7 6
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	37/6	—	3 14 8
County of London	1	10½	10½	53/9	—	3 18 1
Edmundson's 7% Pref.	1	7	7	31/-	—	4 10 4
Elec. Dis. Yorkshire	1	9	9	45/-	—	4 0 0
Elec. Supply Corporation	1	11	11	70/-	—	3 2 10
Kensington Ordinary	1	8	7	32/6	—	4 6 2
Lancs Light and Power	1	7	7	32/6	—	4 6 2
London & Home Counties 4½%Deb.	Stock	4½	4½	107	—	4 4 1
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	50/-	—	4 0 0
Midland Counties	1	7	7	35/-	—¼	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 4
North Eastern Electric Ordinary	1	6	6	31/6	+6d.	3 16 2
Do. 7% Pref.	1	7	7	32/6	—	4 6 2
Northampton	1	10	10	50/9	—	3 18 9
Notting Hill 6% Pref.	10	6	6	13	—	4 12 4
North Met. Elec. 6% Pref.	1	6	6	29/-	—	4 2 9
St. James' and Pall Mall	1	8	7	32/-	–	4 7 6
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-	—	4 4 10
Urban Ordinary	1	7	7	38/9	—	3 12 2
Westminster Ordinary	1	8½	7	32/6	+6d.	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	43/9	+¼	3 13 3

HOME RAILS.

London Passenger Transport. C	Stock	Nil	Nil	78	+1	—
Do. do. 4½% A	„	Nil	Nil	113	—	3 19 8
Do. do. 5% B	„	Nil	Nil	117½	+½	4 5 1
Metropolitan	„	2½	1½	76	—	—

TELEGRAPH AND TELEPHONES.

American Tel. & Tel.	$100	9	9	137½	+2	6 11 0
Anglo-Am. Tel. Pref.	Stock	6	6	109	—	5 10 1
Do. Def.	„	1½	1½	28	—	5 5 3
Cables & Wireless 5½% Pref.	„	2¾	2¾	83½	—	3 5 10
Do. A 7½% Ord.	„	Nil	Nil	31	—	—
Do. B. Ord.	„	Nil	Nil	14	—	—
Globe Tel. and T. Ord.	10	Nil	2½	12½	—	2 0 10
Do. do. Pre.	10	6	6	12	—	5 0 0
Great Northern Tel.	10	20	20	32½	+½	6 3 0
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12	12	2¾	—	*4 3 6

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/3	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	10½	—	—
British Electric Traction Df. Ord.	„	5	5	420	—	—
Do. do. Pref. Ord.	„	8	8	142½	+4½	5 12 3
Brazil Traction	100	—	—	14⅞	—⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	100½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	20/-	—	—
Mexico Trams, 5% Bonds	—	5	5	32½	—	15 7 8
Mexican Light Common	100	Nil	Nil	16	— 1½	—
Do. 7% Pref	100	7	7	17½	—	—
Do. 1st Bonds	—	5	5	65½	—	7 12 8
Victoria Falls Ord.	1	15	20	91/3	—	4 7 7
Yorkshire (West Riding)	1	Nil	Nil	11/-	—	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	4	4	20/-	—	4 0 0
Do. Pref.	1	8	8	28/9	—	5 11 5
Babcock & Wilcox	1	14	9	37/-	—	4 17 3
British Aluminium Ord.	1	5	5	31/3	—	3 4 0
British Insulated Ord.	1	15	15	72/6	—	4 2 4
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3⅛	—	4 17 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	10/-	—⅛	—
Do. do. Pref.	1	Nil	Nil	14/6	—	—
Ever Ready	5/-	35	35	28/-	—9d.	6 2 6
Ferranti Pref.	1	7	7	24/9	—	5 13 2
G.E.C. Pref.	1	6½	6½	29/0	—	4 9 8
Do. Ord.	1	8	8	42/6		3 15 2
Henley's	1	30	30	6½	—	4 16 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	5	5	22/-	—	4 11 0
Siemens Ord.	1	7½	6½	24/6	—	5 6 0
Telegraph Construction	£1	Nil	Nil	22/6	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings taken.

1931

22997. "Electric ignition devices for fuel-oil and gas burners." Asiatic Petroleum Co., Ltd., I. Lubbock, and J. R. Joyce. May 17th, 1932. (395415.)

27461. "System for the remote supervision of electric power circuits." Aktieselskapet Elektrisk Bureau and A. Aanderud. October 2nd, 1931. (395347.)

27724. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri, et Cie. October 8th, 1930. (395383.)

28071. "Electric arc welding." C. Arnold (Lincoln Electric Co.). October 9th, 1931. (395348.)

28144. "Arc rectifiers." Siemens-Schuckertwerk Akt.-Ges. December 17th, 1930. (395349.)

31191. "Method and means for synchronising television systems." E. Hudec. November 11th, 1930. (395373.)

31606. "Transmission gears for electric locomotives and the like." Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., G. A. R. Trimming, and C. J. H. Trutch. November 14th, 1931. (395375.)

34208. "Signals for controlling traffic." G. R. Croxford. December 10th, 1931. (395385.)

1932

429. "Electrolytic treatment of aluminium or its alloys." C. H. R. Gower and E. Windsor-Bowen. January 6th, 1932. (395390.)

794. "Protection of cathodes of thermionic valves." British Thomson-Houston Co., Ltd. January 10th, 1931. (395344.)

820. "Telephone systems." Automatic Electric Co., Ltd. January 10th, 1931. (Addition to 356143.) (395346.)

883. "Loud speakers." A. C. Gardner and W. G. Baxter. January 12th, 1932. (395361.)

954. "Electrical resistances, heaters, and the like." Expanded Metal Co., Ltd., E. T. Williams, and S. W. Melson. January 12th, 1932. (395363.)

978. "Gang condensers." W. Rogers, and Wingrove and Rogers, Ltd. January 13th, 1932. (395396.)

1233. "Leading-in bushings for the electrodes of mercury vapour rectifiers and similar vacuum discharge apparatus." Akt.-Ges. Brown, Boveri, et Cie. January 20th, 1931. (395400.)

1251. "Screening of sparking-plugs." Standard Telephones and Cables, Ltd., D. A. Hansard, and B. Jones. January 15th, 1932. (395401.)

1252. "Means for converting direct current into pulsating or alternating current." Igranic Electric Co., Ltd. January 19th, 1931. (395402.)

1274. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. January 15th, 1932. (395404.)

1718. "Electrolytic condensers." Standard Telephones and Cables, Ltd., G. W. Clarke, and H. S. Leman. January 20th, 1932. (395416.)

1720. "Alternating-current signalling systems." Standard Telephones & Cables, Ltd., T. S. Skillman, P. R. Thomas, and K. G. Hodgson. January 20th, 1932. (395418.)

1773. "Electric traction systems." W. T. Gray and Associated Electrical Industries, Ltd. January 20th, 1932. (395419.)

1774. "Electrical condenser." H. Smethurst, and Associated Electrical Industries, Ltd. January 20th, 1932. (395420.)

1803. "Method and means for controlling an electrical circuit by light." P. St. J. Heaton. January 20th, 1932. (395422.)

2388. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. January 26th, 1931. (395425.)

3598. "Cover for electric light tumbler switches and the like." W. F. Hauser. February 6th, 1932. (395431.)

4124. "Portable ultra-violet electric discharge lamp." W. O. Prouty. February 11th, 1932. (395436.)

4247. "Cam-operating mechanism for electric switches with key or spring contacts." Landis & Gyr Akt.-Ges. February 17th, 1931. (395438.)

4716. "Thermionic valves." Mullard Radio Valve Co., Ltd., and B. Krol. February 17th, 1932. (395439.)

4753. "Electrical transformers." A. E. Chapman. February 17th, 1932. (395441.)

6023. "Electric radiators." Ferranti, Ltd., and W. V. Butterfield. February 29th, 1932. (395445.)

6502. "Fused coupling-plugs and other electrical appliances embodying fuses." J. A. Crabtree and B. G. Harrison. March 4th, 1932. (395447.)

6916. "Change-speed gears, particularly applicable to electricity, gas, or other meters of the coin-freed prepayment type." R. W. Jolly and British Electric Meters, Ltd. March 8th, 1932. (395449.)

7431. "Tramway, trolley-bus or like trolley heads." Metropolitan Electric Tramways, Ltd., and J. Schofield. March 12th, 1932. (395451.)

7570. "Alternating-current commutator motors." International General Electric Co., Inc. March 13th, 1931. (395453.)

7909. "Electric switches of the quick-make-and-break type." C. H. Parsons, Ltd., and G. B. Handley. March 17th, 1932. (395454.)

8514. "Production of porous or permeable coatings for use in galvanic cells." G. Ludecke and Graphitwerk Kropfmukl Akt.-Ges. March 23rd, 1931. (395456.)

8563. "Electric heaters." General Electric Co., Ltd., and W. H. Grafton. March 22nd, 1932. (395097.)

8644. "Electric tumbler switches." A. P. Lundberg & Sons, Ltd., and G. Pegg. March 23rd, 1932. (395459.)

10429. "Manufacture or production of electrical socket-couplings, adaptors, and the like." J. A. Crabtree and B. G. Harrison. April 12th, 1932. (395469.)

12229. "Flexible electric cables." Callender's Cable & Construction Co., Ltd., V. T. Burchall, J. Bowyer. April 28th, 1932. (395481.)

12749. "Electric lighting systems of electrically propelled vehicles." British Thomson-Houston Co., Ltd., J. H. Cansdale. January 9th, 1932. (Divided application on 720/32.) (395372.)

14118. "Electric accumulators." Chloride Electrical Storage Co., Ltd., and H. Dean. May 18th, 1932. (395488.)

16101. "Means for driving magneto-electric machines." Fairey Aviation Co., Ltd., and A. C. Forsyth. June 7th, 1932. (395497.)

16236. "Television systems." Marconi's Wireless Telegraph Co., Ltd. June 17th, 1931. (395499.)

16366. "Electrical suspension switch." R. Nettl. June 10th, 1932. (395500.)

16513. "Interlock arrangements on draw-out electric switchgear." J. Swinney and Associated Electrical Industries, Ltd. June 11th, 1932. (395502.)

17676. "Manufacture of magnetic electrolytic iron." International General Electric Co., Inc. June 22nd, 1931. (395505.)

18395. "Sound-amplifying horns." S. Coumbopoulos. July 31st, 1931. (395506.)

19378. "Electrodes for welding." Elektriska Svetsnings Aktiebolaget and P. Y. Sjoman. July 8th, 1932. (395510.)

20797. "Electric supply system for other than traction purposes on transport vehicles." W. P. Kellett. July 23rd, 1932. (395520.)

22666. "Quick action electric switches." International General Electric Co., Inc. August 12th, 1931. (395526.)

23494. "Electric discharge tubes." International General Electric Co., Inc. August 20th, 1931. (395529.)

23965. "Testing apparatus for sparking-plugs of internal combustion engines." A. Durst. August 28th, 1931. (395531.)

25305. "Highly emissive cathodes for electric discharge apparatus." Dr. S. Loewe. September 15th, 1931. (395537.)

28735. "Radio receiving and relaying apparatus." J. Preh, jun. May 11th, 1932. (395549.)

30829. "Central electrodes of sparking-plugs." S. J. R. Fox. November 2nd, 1932. (395557.)

33427. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. November 25th, 1931. (395569.)

33745. "Apparatus for indicating or/and recording electrically the variations of a quantity such as the flow of fluids." J. E. Lea. November 29th, 1932. (395573.)

34406. "Radioscopy." I. G. Farbenindustrie Akt.-Ges. December 3rd, 1931. (395578.)

34479. "Electric arc carbons." Compagnie Lorraine de Charbons pour Electricité. December 4th, 1931. (Cognate application 34480/32.) (395580.)

35798. "Electric warp-stop motions for weaving-looms." O. Held and H. Held (trading as Firma C. C. Egelhaaf). July 8th, 1932. (395592.)

36109. "Circuit arrangement for generating or amplifying electric oscillations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 8th, 1932. (395596.)

36188. "Device for bending pole strips of galvanic batteries." Baumgarten K. and F. Roessler. December 22nd, 1931. (395598.)

1933

2544. "Switch mechanism for electric transformers." B. Jansen. January 26th, 1932. (395622.)

3220. "Sealing system for the shaft bearing of gas-cooled electrical machines." Maschinenfabrick Oerlikon. February 13th, 1932. (395626.)

3228. "Optical systems of analysis for television." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. February 2nd, 1932. (Addition to 373539.) (395627.)

3319. "Telegraph electric, and other poles." J. F. Barr. February 3rd, 1933. (395628.)

3459. "Thermionic valve holders or like contact socket devices." Standard Telephones and Cables, Ltd., and L. H. Webb. February 4th, 1933. (395629.)

3624. "Polyphase grid-controlled electrical discharge devices." Siemens-Schuckertwerke Akt.-Ges. February 6th, 1932. (395632.)

5877. "Manufacture of cylindrical metallic containers, especially zinc containers for the cells of electric dry batteries." R.A.M.S. Metal Works, Ltd., and A. Asrelwitch. February 27th, 1933. (395643.)

6644. "Method and apparatus for electric resistance welding of metals." D. Sciaky. March 4th, 1933. (395647.)

6851. "Electric starters for internal-combustion engines." R. Bosch Akt.-Ges. March 15th, 1932. (395651.)

7955. "Connectors for electric storage batteries." R. Anderson. March 16th, 1933. (395654.)

8672. "Electric discharge devices." International General Electric Co., Inc. March 22nd, 1932. (395660.)

8974. "Electric protective arrangements." International General Electric Co., Inc. March 24th, 1932. (395661.)

9744. "Arc welding." British Thomson-Houston Co., Ltd. April 1st, 1932. (395663.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 2nd :—

N.T.; Newtons of Taunton (lettering and design). Nos. 537696, 537697, 537698, and 537699. All goods in Classes 6, 8, 13, and 18.—Newton's of Taunton, Ltd., Herbert Street, Taunton.

Vulco. No. 542198. Class 8. Electric batteries (not for medical purposes).—The Vulco Dry Battery Co., Ltd., Vulco Works, Marlborough Road, N.19.

Ever Ready. No. 541812. Class 10. Clocks.—The Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Albrico. No. 540647. Class 13. Metal goods.—The Allbright Electric Co., Ltd., 2-5, Dingley Place, City Road, E.C.1.

Pearl (lettering and design). No. 542319. Class 13. Electric irons.—Thomas Winston, 82, Ryland Road, Edgbaston, Birmingham.

Markets for Radio Apparatus

Reports have been issued by the Department of Overseas Trade on the markets for radio apparatus in France, Bulgaria, Jamaica, and British Malaya.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Ice rink; Lord Sempill.

Alcester.—Houses (40); Alcester Builders, Ltd., contractors.

Arnold Bentwell.—School (£12,800); H. James, Junr., Mansfield.

Barnstaple.—Houses (75), Cyprus Terrace, for J. Cater & Sons; architects, Oliver & Son.

Basingstoke.—Houses (84), South Ham; borough surveyor.

Beddington & Wallington.—Cinema and shops, Woodcote Road, for Cinema Services, Ltd. Shops and flats (£13,500), Station Approach, for the Southern Railway, Ltd.; chief engineer.

Birmingham.—Houses (30), Warwick Road, Olton; Stubbs Bros., builders, Brookvale Road, Olton. Alterations and improvements to factory premises, Vittoria Street, Hockley, for P. H. Currie (£5,000); Bowen Bros., builders, Bloomsbury Street, Nechells. Reconstruction of Horton Hub and Engineering Co.'s buildings, Brearley Street (£5,000), with electrical work; Maddocks & Walford, builders, Tyburn Road, Erdington.

Blackpool.—Additions to Convent of the Holy Child, St. Walburga's Road; Mother Superior. New department, Highfield School; Herbert Joyce & Sons, Ltd.

Bolton.—Houses (10), Almond Street; W. E. Yates. Houses (18), Chorley Old Road; A. T. Reynolds & Co. Houses (52), Great Marld Estate; W. Townson & Sons. Houses (24), Melbourne Road; J. R. Bushell. Houses (44), Thorndyke Estate; E. & S. Street, Ltd. Alterations to 80, Blackburn Road; Britannic Assurance Co., Ltd.

Burton-on-Trent.—Extensions, Nursing Institution (£6,500); E. J. Manners, president, Union Street.

Cannock.—Café, dance hall and swimming pool, Stafford Main Road, near Huntington; F. & E. V. Linford, builders, Sim Lane.

Chesterfield.—Houses (177); borough engineer.

Chislet.—Houses (512), Hersden, for the Colliery Co.; C. J. F. Martindale, architect, Deal.

Coventry.—Shops, Walsgrave Road; A. E. White, builders, Anstey Road.

Darlington.—School (480 places), Gladstone Street, for E.C.

Durham.—Hospital wards, Chester-le-Street and Bishop Auckland (£19,950); county architect, Old Elvet. Catholic school (250 places), Springwell Hall; Canon Thornton.

Eastbourne.—Bathing pool (£65,000); borough engineer. Rebuilding of Royal Marine Laundry, Winchelsea Road; A. Ford, architect.

Edinburgh.—Extension scheme for the Royal Infirmary—Maternity Hospital, and new nurses' home; medical superintendent.

Egham (SURREY).—Houses (172); U.D.C. surveyor.

Epsom.—Shops, the Broadway, Stoneleigh Park Estate; Atkinson & Marler, architects, 21, Maddox Street, London, W.1.

Erdington (NEAR BIRMINGHAM).—Presbyterian Church of England, Orphanage Road, for the Rev. W. S. Ferrie, 14, York Road (£12,000).

Erith.—School, Belvedere; chief education officer.

Essex.—School, Bifrons (£29,372), for County E.C.; Thomas Bates & Sons, Ltd., builders. Eight schools, Hornchurch Housing Estates, for County E.C.; director of education, Chelmsford.

Exeter.—Houses (500) for slum clearances; city engineer.

Farnham.—Houses, Wracclesham; Monk & Cox.

Faversham.—Shops, Preston Street (electrical work); E. Pover & Son, architects, Park Road.

Ferryhill Station (DURHAM).—Houses (18), Eldon Terrace, for G. W. Lazenby.

Glasgow.—R.C. school, Crosshill; education director and trade contractors.

Glossop.—Showroom extensions, 26, High Street; A. Bagshaw & Son. Extensions, West End School; governors.

Halifax.—Shops and houses, King Cross Street (£21,300); borough engineer.

Harrow Weald.—Shops and flats, Great West Road; G. H. Syrett.

Haslemere.—Houses (24), Hindhead; U.D.C. surveyor.

Henstead (NORFOLK).—Houses (50); R.D.C. surveyor.

Hoyland (YORKS).—Houses (40) and cemetery chapel; U.D.C. surveyor.

Hull.—Houses (500), Endyke Estate; city architect. Buildings, Tilworth Mental Colony (£12,300); city architect. Cinema for Ashford Trust, Ltd., Holderness Road; Jas. E. Adamson, architect, 56, Victoria Street, London, S.W. Villa, mental hospital (£5,657); T. L. Cooper, Conisborough. School, Maybury Road (£17,431); city architect.

Hurworth.—School (£7,790); H. Parvin, Darlington.

Ilford.—Houses (74), Bergolt Avenue, &c.; P. G. Ashton. Fourteen shops and houses, Eastern Avenue; Holland Bros. Houses (24), Eton Road; R. Cooper. Houses (148), Langman Drive, &c.; G. F. Seigerts. Houses (32), Mortlake Road; E. Glenny & Son. Three shops and houses, Centley Drive, &c., and 24 houses, Headley Drive; J. Aldridge. Extension to electricity showrooms, High Road (£8,300) for T.C.

Inverness.—Houses (100), for the Corporation (£28,755); burgh surveyor.

Irish Free State (KILKENNY).—Houses (80); R. F. Bowen, borough surveyor, City Hall. (YOUGHAL, Co. CORK).—Additions to technical school for County Vocational E.C.; D. J. Tierney, architect, 85, South Mall, Cork.

Keighley.—Extensions, bus depôt, Sureness Road; West Yorks Road Car Co., Ltd.

Kent.—School (350 places), Woolwich Road, Bexley; director of education, Maidstone.

Kirkcudbright.—Houses (24); burgh surveyor.

Lancashire.—School, Little Lever near Bolton; J. Hartley, builder, Cobden Street, Chadderton, Oldham.

Leamington.—Extensions, Warneford Hospital (£13,500); Armstrong & Gardner, architects, Warwick.

Leeds.—Houses (32), Hillridge Estate (£9,112); W. J. & R. Turnbull. Houses (44), Torre Estate (£12,594); W. B. Cooper & Sons, Ltd. Houses (3,000); city architect. Cinema, Acre Road; Goldstones Cinemas, Ltd. Cinema, Chapel Street, Halton; Mrs. C. B. Jones. Estate development, Roman Grove, Gladhow; W. H. Parkinson. Premises, Back York Street; C. A. Wilkinson & Co.

Lincolnshire.—Conversion of Louth Institution into hospital (£60,000), for Lindsey C.C.; clerk, Lincoln.

London.—(ST. JOHN'S WOOD).—Block of flats, 18, Abbey Road, and 33-5, Grove End Road; Western Heritable Investment Co., Ltd. Block of flats, on the site of 78-84, Grove End Road; R. Atkinson. (ST. MARYLEBONE).—Block of flats, 2-5, Hall Road; W. H. Potts. Shops and flats, Park Road; T. P. Bennett & Son, architects.

Mitcham.—Houses (74); U.D.C. surveyor.

Newburn-on-Tyne.—Houses (200); J. H. Weatherley, surveyor, Council Offices.

Newbury.—Houses (20), Enborne Place (£6,280); J. G. Norman & Son.

Nottingham.—Houses (4,023); city architect.

Paignton.—Houses (76), Blatchcombe Road; L. J. Boyce, architect, 2, Hyde Road Corner.

Purfleet (ESSEX).—Houses (44), Aveley; U.D.C. surveyor.

Reading.—Eight shops, Kentwood Hill, Tilehurst, for Frank Scrivener & Co. Houses (282), Caversham; E. A. D. Tanner, architect, 9, Tavistock Road, Croydon. Houses (206), King & Co., builders, Turner Street, Newport, Mon. Extensions, Park Hospital (£3,536); W. Roland Howell, architect.

Richmond (SURREY).—Houses (46); borough surveyor.

Rotherham.—Houses (270), Eastwood Estate (£88,397); borough engineer.

Runcorn.—Houses (48); R.D.C. surveyor.

Sheffield.—Houses (58), Mansfield Road; J. H. Naylor & Son. Houses (200), Shiregreen Estate (£60,879); W. Malthouse, Ltd. Houses (186), Woodthorpe Estate (£56,587); M. J. Gleeson, Ltd.

Shirley (BIRMINGHAM).—Shops, Marshall Hall Road with electrical work; Jones & Croxford, architects, 29, Waterloo Street, Birmingham.

South Shields.—Houses (1,800) and tramway offices, Dean Street (£2,100); borough engineer.

Smethwick (BIRMINGHAM).—Garage, for Normansells Cold Storage, Beakes Road (£3,000) with electrical work; W. C. Stevens, Ltd., builders, Beakes Road. Extensions, bakery, Hume Street; Scribbans & Co., Ltd.

Solihull.—Estate development, Church Hill; Biddle & Homer, Ltd. Development of Sandal House Estate; R. King, Somerville Road, Sutton Coldfield.

Southgate.—Houses (175), Chase Vale Farm Estate; Geo. Wimpey & Co., Ltd. Houses (152), Stone Hall Estate; E. J. Westoby & Son. Flats, shop, &c., Hazelwood Lane; C. S. Brown. Stores extensions, Green Lanes; London Co-operative Society, Ltd.

Stockport.—Extensions, Stepping Hill Hospital, including X-ray dept.; Pierce & Son, architects, St. Petersgate.

Stretford.—Houses (35), Lindum Road; Smith & Allcock. Houses (78), Manor Road; Archer & McAlpin.

Surbiton.—Houses (90), Lower Marsh Lane, for the Workmen's Housing Association.

Surrey.—Two schools, St. Helier Estate, Carshalton (£61,000) and extensions, Council School, Caterham (£12,350); County architect, Kingston-on-Thames. Elementary school, Park Farm Estate, Cheam, for County E.C.

Teddington.—Maisonettes (30); E. Bostock, U.D.C. surveyor.

Todmorden.—Houses (54), Ashenhurst Estate; James Hodgson & Sons, builders, Nottingham.

Twickenham.—Block of flats, for H. & L. Sloggett, 120, High Street, Hampton Hill.

Tynemouth.—Four shops with living accommodation, Wallsend Road (£3,600); Wm. Stockdale, architect, 73, Howard Street, North Shields.

Wallsend-on-Tyne.—Houses (56), Churchill Street; Battle Hill Estate Co. Houses, Coast Road; C. Holland Besley for G. E. Hadden, Ltd., builders. Houses (84), Holy Cross (£31,600); borough engineer. Flats (24), Shafto Street, Willington Estate Co.

Warwickshire.—Nurses' home for mental hospital, Warwick (£21,114), and schools, Sharman's Cross (£10,000), Exhall and Warstock (400 places); county architect.

Wealdstone.—Estate development, Farrers Road; John Farrer & Sons.

Wellington.—Houses (100), Haygate Road and Holyhead Road, for the Haygate Estates, Ltd.

West Hartlepool.—Municipal buildings, Victoria Road; Mr. Durkin, borough engineer.

West Riding.—Senior school, Snydale Road, Cudworth (£15,919), for County E.C.

Weymouth.—Congregational Church, Radipole, and houses; Andrews & Andrews, architects.

Witney (OXON).—Houses (20); A. J. Basford, R.D.C. surveyor, Blanket Hall.

Wokingham (BERKS).—Development of Erlegh Court Estate; Estate Co.

Wolverhampton.—Houses (20), Arthur Street; J. Walton. Houses (20), Cannock Road; M. A. Boswell. Houses (1,236); borough engineer. Offices, Princes Hall (£2,194); H. J. Amies & Sons. Additions to St. Chad's College, Old Fallings; Marist Brothers.

Workington.—Houses (60), Salterbeck Estate; borough engineer.

Worthing.—Houses (22), Goldsmith Road, &c.; M. R. Fletcher, architect. Houses (62), Leighton Avenue, &c.; R. Hasler. Completion of Town Hall (£40,000); borough surveyor.

Yeovil.—Re-erection of works, Woodland Grove, for A. E. Stevens & Co.